PHASE 2 REMEDIAL ACTION HEALTH AND SAFETY PLAN FOR 2011

HUDSON RIVER PCBs SUPERFUND SITE

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TABLE OF CONTENTS

Page

TABLE OF CONTENTS
(CONTINUED)

TABLE OF CONTENTS
(CONTINUED)

Page

TABLE OF CONTENTS (CONTINUED)

Page

TABLE OF CONTENTS
(CONTINUED)

TABLE OF CONTENTS
(CONTINUED)

TABLE OF CONTENTS (CONTINUED)

Page

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS (CONTINUED)

LIST OF ATTACHMENTS

LIST OF APPENDICES

LIST OF ACRONYMS

°F	Degrees Fahrenheit (°F)
µG/M3	Micrograms per Cubic Meter
ACGIH	American Conference of Governmental Industrial Hygienists
AED	Automated External Defibrillator
ANSI	American National Standards Institute
CARA	Cultural and Archaeological Resources Assessment
CAZ	Controlled Access Zone
CD	Consent Decree
CDZ	Controlled Decking Zone
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHST	Construction Health and Safety Technician
CIH	Certified Industrial Hygienist
CII	Construction Industry Institute
CM	Construction Manager
COC	Constituents of Concern
CPR	Cardiopulmonary Resuscitation
CRZ	Contaminant Reduction Zone
CSP	Certified Safety Professional
dBA	Decibels on the A-scale
DEET	Diethyl Toluamide
DGPS	Differential Global Positioning System
EDC	Engineering Data Collection
eDMS	Environmental Data Management System
EHS	Environmental, Health and Safety
EMS	Emergency Medical Services
EPA	Environmental Protection Agency
EPS	Engineering Performance Standards
EZ	Exclusion Zone
FCE	Functional Capacity Examination
FWPCA	Federal Water Pollution Control Act

LIST OF ACRONYMS (CONTINUED)

GE	General Electric Company
GFI	Ground Fault Circuit Interruption
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High-Efficiency Particulate Air
JSA	Job Safety Analysis
LED	Light-Emitting Diode
LOTO	Lockout/Tagout
MG/M^3	Milligram per Cubic Meter
MPH	Miles per Hour
MSDS	Material Safety Data Sheet
NFPA	National Fire Protection Association
NIOSH	National Institute For Occupational Safety and Health
NOV	Notice of Violation
NRC	National Response Center
NRR	Noise Reduction Ratio
NYSCC	New York State Canal Corporation
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OHST	Occupational Health and Safety Technician
OPA	Oil Pollution Act
OSHA	Occupational Safety and Health Administration
PADI	Professional Association of Diving Instructors
PCB	Polychlorinated Biphenyl
PEL	Permissible Exposure Limit
PFD	Personal Flotation Device
PPE	Personal Protective Equipment
PRCS	Permit Required Confined Spaces
PSI	Pounds per Square Inch
PSM	Project Safety Manager
PVC	Polyvinyl Chloride

LIST OF ACRONYMS (CONTINUED)

QoLPS	Quality of Life Performance Standards
R&D	Receiving and Departure
RA	Remedial Action
RA CHASP	Remedial Action Community Health and Safety Plan
RA HASP	Remedial Action Health and Safety Plan
RAWP	Remedial Action Work Plan
RD	Remedial Design
RIP	Repair In Place
RMSF	Rocky Mountain Spotted Fever
ROD	Record of Decision
RQ	Reportable Quantity
SENRAC	Steel Erection Negotiated Rule Advisory Committee
SMS	Safety Monitor System
SOP	Standard Operating Procedures
SOW	Statement of Work
SPCC	Spill Prevention, Control and Countermeasure
SSAP	Sediment Sampling and Analysis Plan
SSHO	Site Safety and Health Officer
SSO	Site Safety Officer
SSR	Site Safety Representatives
START	Supervisory Training in Accident Reduction Techniques
SZ	Support Zone
TLV	Threshold Limit Value
TWA	Time-Weighted Average
UFPO	Underground Facilities Protection Organization
USCG	United States Coast Guard
VHF	Very High Frequency

SECTION 1

INTRODUCTION

In 2005, the General Electric Company (GE) and the United States Environmental Protection Agency (EPA) executed a Consent Decree (CD) relating to the performance of the Remedial Action (RA) selected by EPA to address polychlorinated biphenyls (PCBs) in sediments of the Upper Hudson River, located in New York State, through dredging, as described in EPA's February 2002 Record of Decision (ROD) for the Hudson River PCBs Superfund Site (EPA 2002). The CD was filed in federal district court on October 6, 2005 (EPA/GE, 2005) and was approved and entered by the court as a final judgment on November 2, 2006, when it went into effect.

In accordance with the ROD and the CD, the RA was to be conducted in two phases. Phase 1 was defined as the first year of dredging and was conducted by GE in 2009. Phase 2 consists of the remainder of the dredging project. The CD provided an option to GE, following EPA's decision regarding the Performance Standards and scope of Phase 2, as to whether to elect to perform Phase 2 under the CD. After an intensive peer review process, EPA issued its decision regarding the Performance Standards and scope of Phase 2 in December 2010; and GE has elected to perform Phase 2 under the CD.

The CD includes, as Appendix B, a Statement of Work (SOW) for Remedial Action and Operations, Maintenance and Monitoring, which sets forth a number of general requirements for the RA and includes several attachments specifying requirements for various aspects of the RA. The SOW required a number of work plans, including a *Remedial Action Health and Safety Plan.* EPA issued revised versions of the SOW and its attachments for Phase 2 in December 2010. For the work to be performed in each construction year of Phase 2, Section 3.1.3 of the revised SOW requires GE to prepare, by February 15 of that year (or such alternate date as is agreed to by GE and EPA), an update to the *Remedial Action Health and Safety Plan* for such year. This *Phase 2 Remedial Action Health and Safety Plan for 2011* (RA HASP) has been prepared to meet this requirement.

This 2011 RA HASP presents the health and safety plan that will govern implementation of the Phase 2 RA for the Upper Hudson River in 2011, including the following:

- Processing facility upgrades and operations;
- Dredging operations;
- Habitat construction (including any remaining habitat construction activities in areas dredged in Phase 1);
- Rail yard operations;
- RA monitoring (sediment, fish, water column and Quality of Life); and

- Any other data collection activities conducted, i.e., engineering data collection, base-mapping, habitat assessment, and/or cultural resource assessment.

A separate *Phase 2 Remedial Action Community Health and Safety Plan for 2011* (2011 CHASP) (Parsons, 2011) will address community health and safety concerns and inform the community of emergency procedures during remedial activities. The 2011 CHASP will be submitted as Appendix F to the *Remedial Action Work Plan for Phase 2 Dredging and Facility Operations in 2011* (2011 RAWP) (Parsons 2011a). The 2011 CHASP will be available for review at the EPA's Hudson River Field Office at 421 Lower Main Street in Fort Edward, New York; at information repositories located in Glens Falls, Saratoga Springs, Albany, Poughkeepsie, and New York City, New York; and on the USEPA's website, available at: www.epa.gov/hudson.

If additional field activities are identified during the course of remedial activities that are not covered by this RA HASP, GE will develop and submit to the EPA, addenda to this RA HASP to cover such additional field activities. Upon EPA review of such addenda, the addenda will be available for review at the same locations noted above, and the provisions of such addenda will be implemented.

1.1 OBJECTIVES

The safety goal for the Project is zero incidents and zero injuries, with work tasks designed to minimize or eliminate hazards to personnel, equipment, the environment, and the general public. No individuals shall perform tasks that may endanger their own safety and health or that of others. In other words, all individuals are empowered to have "stop work authority".

This RA HASP outlines safety and health requirements and guidelines developed for Project work. When implemented, these requirements will help protect site personnel, visitors, the public, and the environment from exposure to potential safety and health hazards.

This RA HASP will be updated as conditions or situations change.

The objectives of this RA HASP are to:

- Identify the physical, chemical, and biological hazards potentially present during field work associated with the RA Work Plan;
- Prescribe the protective measures necessary to control those hazards;
- Define emergency procedures; and
- Prescribe training and medical qualification criteria for site personnel.

This RA HASP must be reviewed by all contractor and subcontractor managers, supervisors, foremen, and safety personnel. All other Project personnel performing field activities will receive a site-specific project safety orientation summarizing the content of the RA HASP. If requested, project personnel will be provided the time necessary to review the entire RA HASP. All personnel will be required to sign the appropriate documentation acknowledging an understanding of the RA HASP. Visitors will also be required to receive an abbreviated project safety orientation, in addition to being escorted by an authorized project team member when going on the site.

Each contractor is required to prepare a Contractor HASP that covers its specific scope of work. The Contractor HASPs shall meet the minimum requirements defined in this RA HASP and the Contract Documents. The Contractor HASPs are available on request.

1.2 SITE SETTING

The Hudson River is located in eastern New York State and flows approximately 300 miles in a generally southerly direction from its source, Lake Tear-of-the-Clouds in the Adirondack Mountains, to the Battery, located in New York City at the tip of Manhattan Island. EPA issued its ROD for the Upper Hudson River (UHR) on February 1, 2002 (EPA 2002). The UHR is defined as the section of river upstream from the Federal Dam in Troy, New York.

EPA divided the UHR into three sections (River Section 1, River Section 2, and River Section 3) for the sediment remediation activities outlined in the ROD. The location of each section is described below and presented on the Site Location Map included as Figure 1:

- River Section 1: Former location of Fort Edward Dam to Thompson Island Dam (approximately 6.3 miles)
- River Section 2: Thompson Island Dam to Northumberland Dam (approximately 5.1 miles)
- River Section 3: Northumberland Dam to the Federal Dam at Troy (approximately 29.5 miles)

As noted above, the ROD specified that the sediment remediation activities would be completed in two phases, designated Phases 1 and 2. Phase 1 is defined as the first year of dredging and was performed by GE in River Section 1 in 2009. Phase 2 includes the remaining dredging in all three UHR river sections.

1.3 ZERO INCIDENT PHILOSOPHY

This RA HASP uses the Zero Incident management approach. The safety goal for this project is zero incidents and zero injuries. The Zero Incident philosophy originated with a study by the Construction Industry Institute (CII), which identified specific control measures shown to dramatically reduce the probability of incidents. These control measures, known as Zero Incident Techniques, provide the framework for this RA HASP, and the Project Team's proactive approach to managing the interrelated areas of safety, health, environment, and risk management. The definition of an incident is any unplanned or unexpected event that results in a personal injury, property damage or environmental release. The definition of a near-miss incident is any unplanned or unexpected event that has the potential to result in a personal injury, property damage or environmental release.

To ensure the success of the RA HASP, the project safety culture must be dynamic and evolving. This begins with training all management personnel in the foundations and philosophy of the Zero Incident Techniques through Supervisory Training in Accident Reduction Techniques, known as the START program. This training lays the groundwork for a successful project by creating accountability and responsibility for the safety and risk process with all individuals. The nine focus areas for our success are:

Zero Incident Techniques: A Snapshot of What and Why		
Key Technique		**What and Why**
1	Demonstrated Management Commitment	All levels of management consistently display their commitment to the safety management process. As organization leaders, managers are role models whose actions send a strong message to employees.
2	Staffing for Safety	Each company funds a full-time lead safety person, either a site safety officer (SSO) or site safety and health officer (SSHO), in addition to site safety representatives (SSRs) as required, to assist in implementing and administering the RA HASP. The safety personnel consult with line organizations, helping to emphasize that safety is the responsibility of each employee on the project, not just the safety department.
3	Safety Planning – Pre-project/Pre-task	Planning safety into design and construction by using activity hazards analyses are key to eliminating incidents in the workplace. Planning job tasks with safety as a key component raises safety awareness of supervisors and employees. Pre-task planning improves productivity and reduces the negative impact of direct and indirect costs of incidents.
4	Safety Training and Education	Orientations and training sessions are conducted at all levels of an organization, as appropriate. Specialized training is also conducted to provide specific knowledge about hazardous work activities. Ongoing safety orientation and training gives employees the knowledge and skills to complete their job tasks without incident.
5	Worker Involvement and Participation	Empowering employees to identify hazards in the workplace is a valuable tool to increase safety awareness. Employee observation programs drive the behavior-based process. When employees identify and have the ability to correct hazards in the workplace, safety motivation and awareness increase and fewer incidents occur.
6	Recognition and Rewards	Employee recognition programs to reward and recognize employees for safe behavior can be based on individual or group accomplishments. Safe behavior is positively reinforced through management involvement, personal contact, communication, and training.
7	Subcontractor Management	Each organization must ensure that subcontractors comply with safety and health rules and regulations in accordance with contractual requirements. Careful management of subcontractor safety reduces incidents on the jobsite, which prevents injury and damage to property.
8	Incident Reporting and Investigation	Each organization must investigate incidents immediately and report to the appropriate personnel. The investigation process includes root

Zero Incident Techniques: A Snapshot of What and Why		
Key Technique		What and Why
		cause determination and recommendations to prevent future occurrences. "Near misses" are important learning experiences and will be investigated as actual incidents.
9	Drug and Alcohol Testing	Site project personnel are tested for drugs/alcohol: pre-employment, post-accident, random and reasonable suspicion. Testing employees for drugs and alcohol reduces the likelihood of serious incidents as a result of workers being impaired while working on a project.

1.4 REMEDIAL ACTION ACTIVITIES

A description of the tasks expected to be completed under this RA HASP are summarized in the following subsections. The descriptions of these potential field activities are general, since the specific field activities are described in more detail in the Contractor HASP submitted by each contractor performing the work.

1.4.1 Processing Facility Upgrades

Upgrades to the sediment processing facility infrastructure may be required based on modifications to the engineering performance standards (EPS) by EPA. Such modifications may include construction of a second sediment unloading station and/or changes to process equipment and pumps at the size separation process area.

1.4.2 Processing Facility Operations

Operation of the facility includes, but is not be limited to, offloading debris and sediment from barges, separating debris and coarse material from the dredged sediment, sizing the separated debris, mechanically dewatering the fine-grained sediment prior to shipment of the sediment off site to a landfill and treating water generated from storm water and dewatering activities. The Sediment Processing Facility is designed to operate 24 hours per day, 6 to 7 days per week.

Operating the process facility equipment involves operating and maintaining the process facility systems including the barge unloading area, the size separation process area, the slurry force main conveyance system, the thickening and dewatering system, the water treatment plant (process and storm water), the storm water management system, the material staging areas (management and maintenance), material handling including stockpiling, on-site transportation of coarse material, debris, and filter cake; operating and managing the decontamination station; and maintaining the haul road. The facility also has a rail yard loading area for shipment of materials.

The Sediment Processing Facility, with the administration and parking area, is accessed via a 2-mile access road that connects the existing truck route on New York State Route 196 in the Town of Kingsbury, New York to the northern boundary of the facility (Main Access Road). During an emergency the Main Access Road will be supplemented by the East Street Access

Road located at the former Champlain Canal Lock 8 Entrance before the bridge crossing the canal. The Sediment Processing Facility is fenced and gated on all non-water sides. Chain link fencing has also been installed around certain interior portions of the Sediment Processing Facility to restrict unauthorized access. Entry points are either locked or staffed by security personnel to restrict access and minimize potential public trespass.

1.4.3 Dredging Operations

Dredging operations will consist of activities related to the dredging of materials from the river and associated waterways and the subsequent backfilling and capping of the dredged areas. Dredging operations will be conducted within the river with land-based support from the Work Support Marina on the west shore of the river, the Route 4 General Support Property on the east shore of the river, the Moreau Barge loading facility located north of the Work Support Marina on the west bank of the river, the Work Wharf located on the Champlain Canal on the waterfront portion of the Processing Facility, and any additional sites, if any, acquired and developed to support dredging operations as work advances downstream. The dredging operations are described in the following subsections.

1.4.3.1 Dredging

The dredging operations involve clearing overhanging vegetation; removing submerged debris; dredging of targeted sediment with mechanical dredges; operating and maintaining tugs, barges, support boats, and fuel boats as needed; transporting dredged sediments to the Sediment Processing Facility; and installing resuspension controls as needed. Mechanical dredges consist of track-mounted excavators with environmental clam-shell buckets or grapples attachments secured on modular barge platforms. The dredges are moved and positioned by tugs, and secured in place by spuds. The dredges remove the targeted sediment from the river bottom and load the sediment into hopper barges. Tugs transport the hopper barges to the Sediment Processing Facility wharf for offloading and processing of the debris and sediment.

1.4.3.2 Backfill, Capping, and Shoreline Restoration

Backfill, capping, and shoreline stabilization involves the use of front-end loaders, conveyors, material barges, mechanical dredges, tugs, work boats, and other equipment for placing materials as specified in the river. Backfill and cap materials will be stockpiled and loaded at the Moreau Barge Loading Area and any other sites, if any, that may be acquired and developed downstream to support backfill, capping and shoreline restoration. Front-end loaders and a conveyor system will be used to load the backfill and cap materials onto material barges located in the river. Backfill and cap materials are to be transported by barge to the designated areas for placement by a mechanical dredge. The Moreau Barge Loading Area is located in the Town of Moreau off of County Road 29. It is accessed via Highway 197 west from Fort Edward. The area is gated and enclosed, with fencing on all non-water sides.

1.4.4 Habitat Construction

The habitat construction program involves planting submerged and floating aquatic vegetation (SAV), as well as riverine fringing wetland (RFW) vegetation, in areas of the Upper Hudson River that were dredged and backfilled. The work described below applies to the remaining habitat construction activities.

1.4.4.1 SAV Planting

The SAV planting portion of this program consists of the planting of submerged and floating aquatic vegetation in flowing water ranging from two to eight foot depths.

The Work Support Marina, and other downstream marina locations as needed will be used to support the habitat construction work. Prior to planting, SAV plants will be maintained in onsite nurseries located at the Work Support Marina or other approved marina locations. Plants will be transferred from the nurseries at the approved locations to the boats by use of material handling carts. During planting operations, plants will be transferred via boat from the marina to a planting platform. For Phase 1, the planting operation was conducted with divers and a specialized floating dive platform. Although alternate planting means are possible, the dive platform arrangement is anticipated to be used to complete SAV planting.

The planting will be conducted from the adjustable maneuverable dive platform using a dedicated diving team. The diving platform will use spuds to secure it during SAV planting. The maneuverable diving platform will contain complete dive support packages to sustain divers and associated dive tenders as set forth in ADCI and OSHA guidelines. The following support equipment will also be included on the dive platform during planting activities.

- Shelter/changing area with bathroom, fire extinguisher and first aid station
- VHF-FM marine radio and 2-way radio communication with the underwater divers
- SAV handling/transfer area
- Air compressor with air monitoring (hard hat divers)
- Underwater camera monitoring station
- Water heater to provide hot water to the divers in a cold water environment (if necessary)

1.4.4.2 RFW Vegetation Planting

RFW areas of the Upper Hudson River that have been or will be disturbed during dredging operations will be planted with a mixture of wetland plant and seeds. Prior to planting, RFW plants and seed mixtures will be maintained in the onsite nursery located at the Work Support Marina and other downstream marina locations as needed. RFW planting will occur along the river’s edge, to a depth of approximately two feet below the normal river elevation.

Plant plugs will arrive at the site in flats or other containers from which they will be removed as they are planted. Plug planting consists of inserting a dibble or planting bar into the substrate, pushing it to one side to open a hole that is the size of the plug or slightly larger. The tool is typically removed as the plug is inserted into the substrate. The plug is then covered and tamped in. Tamping is typically completed by stepping around the plug prior to moving on to the next hole. Seed mixtures will be spread by hand.

Fencing will be installed during the initial growing season to deter geese and other herbivores from feeding on the plants. The fencing will be removed in the fall at the end of the growing season.

1.4.4.3 Monitoring and Replanting

Plant monitoring will be performed at regular intervals during the initial growing season. Monitoring events will be conducted by boat and may include the use of underwater video equipment.

During the year of planting, a one-time SAV replanting event will be implemented in the fall to ensure that the specified number of plantings have been installed to the satisfaction of the Construction Manager. Undesirable plant species and plants damaged by herbivores will be removed during this time. Data from the monitoring events will be used to determine where to concentrate efforts for replanting the aquatic plants. Replanting activities will be similar to those planting activities already described in this plan.

Maintenance of the RFW areas, consisting of watering, fence repair, removal of undesirable plant species, re-seeding and re-planting will occur during the initial growing season.

1.4.5 Rail Yard Operations

Rail Yard Operations consist of activities required to load and weigh gondola rail cars with processed sediment and debris, switch cars in the rail yard using locomotives, prepare outbound unit trains for shipment to disposal facilities and receive inbound empty unit trains returning from disposal facilities. Rail yard and rail car loading area activities are described in the following subsections.

1.4.5.1 Rail Operations

The rail yard operator switches empty and loaded rail cars on and off Track 1 on Canadian Pacific Railway property. Rail cars to be switched on and off this track consist of unit trains up to 81 cars in length and other miscellaneous freight cars destined for the material unloading track or any other track on the project site. In addition, on Canadian Pacific Railway property, the rail yard operator is responsible for inspecting and repairing the train air supply and associated appurtenances that provide train air to the south end of the Repair In Place (RIP) tracks.

The rail yard operator switches empty and loaded rail cars on and off tracks on the project site. This includes the ladder tracks, receiving and departure (R&D) tracks, set out track, loading yard/scale lead, loading track, material track, RIP track, and engine house track. Rail cars to be switched on and off this track will consist of unit trains up to 81 cars in length and other miscellaneous freight cars destined for material unloading track. The operator performs an inspection of all inbound rail cars. The operator weighs inbound empty and outbound loaded rail cars as required. The operator assembles, inspects, and makes necessary repairs to outbound loaded rail cars to successfully perform a terminal test. The operator is responsible for inspecting and repairing all track, special track work, road crossings, car air supply, and other track and mechanical appliances.

1.4.5.2 Rail Yard Facilities

The operator inspects, maintains, and operates an engine house, track RIP and weigh-in-motion scale that support the project. The operator also maintains facilities and associated tools, machinery, heavy equipment, and automotive equipment (trucks) in a state of good repair.

1.4.5.3 Rail Car Loading Facility

Functions to be performed at the rail car loading facility include activities associated with loading rail cars. A wrap system involves lining of empty rail cars with a vinyl super load wrapper, filling the car, and then folding and securing of the super load wrapper, on loaded cars. The exterior of rail cars will be cleaned as needed, inspected, and then released to rail yard crews for movement back to rail yard.

1.4.6 Remedial Action Monitoring

Remedial action monitoring includes sediment sampling, biota (fish) monitoring, water column, Quality of Life monitoring, processing facility stormwater treatment and discharge outfall monitoring, ecological studies, and waste characterization sampling.

1.4.6.1 Sediment Sampling

Sediment sampling will be conducted in areas of the Hudson River where dredging has been performed to verify that post-dredging conditions meet the project criteria. Sediment sampling will also be conducted in additional areas targeted for dredging in future years to assist with dredge prism development. Core samples will be collected at pre-determined locations along a grid system. The core samples will be collected from a boat equipped for core sampling, using vibracoring, sonic drilling or manual coring techniques. At the end of each day, the cores will be transported to a shore-based processing facility where they will be cut into segments, placed in containers, and submitted for laboratory analysis. If subsequent dredging is performed in a dredge area, another round of sediment sampling may be performed.

1.4.6.2 Biota (Fish) Monitoring

This task involves the collection of fish tissue samples from the Hudson River for chemical analysis of PCBs. The primary collection method for the fish monitoring is electrofishing. Sampling will take place from a project vessel that has mobilized to the sampling location. An electrode is attached to the boat and extends down into the water. An electric current is transmitted from the electrode into the water, thus immobilizing any fish within range. Once the fish float to the river surface, staff then collect them with dip nets and place them in the live well of the boat.

Fish monitoring will be performed in the Upper and Lower Hudson River at the following locations:

Upper Hudson

- Feeder Dam
- Thompson Island Pool
- Northumberland/Fort Miller Pools
- Stillwater Pool

Lower Hudson

- Albany/Troy
- Catskill
- Tappan Zee area

Fish collection will be performed annually at the Upper Hudson Stations and Albany/Troy. Monitoring at Catskill and the Tappan Zee area will be performed every other year. Fish may be collected for analysis using electro-shocking equipment, nets, or by angling. Fish sampling will be conducted from an appropriately equipped boat.

1.4.6.3 Water Column

Water sampling activities will be performed to monitor the in-river activities associated with dredging to assess achievement of the Resuspension Performance Standard and other applicable substantive water quality requirements. The water column monitoring will include the following activities.

- Near- and mid-field water column monitoring;
- Far-field water column monitoring; and
- Off-season water column monitoring.

Near- and mid-field water column monitoring will consist of deployment and operation of floating monitoring stations located in the river in the vicinity of dredging operations. These stations will be used to collect continuous water quality data which will be transmitted routinely to an environmental data management system (eDMS). The near- and mid-field monitoring stations will be maintained on a daily basis. Maintenance activities will include cleaning and calibration of monitoring equipment, and manual collection of water samples. Personnel will service the stations by boat. Far-field water column monitoring will involve the maintenance and operation of fixed automated water sampling stations at three locations on the Upper Hudson River. These stations will pump water from the river on a continuous basis, enabling the collection of water samples using programmable water sampling equipment at predetermined times. Additionally, these stations will be used to collect continuous water quality data which will be transmitted routinely to the eDMS. The automated samplers will be housed in the pump house located on shore. Personnel will travel to the stations in a vehicle and perform maintenance activities on a daily basis. Additionally, samples will be collected manually at Bakers Falls, Rogers Island, and Stillwater; from the Mohawk River, and from the Lower Hudson River. At Bakers Falls and the Mohawk River, samples will be collected from a bridge; Rogers Island, Stillwater and the Lower Hudson River stations will be sampled using a boat. Control measures for working on a bridge are described in Section 4.22. Samples will also be collected manually if an automated water sampling station becomes inoperative; these samples will be obtained either from near-by bridges or by boat, depending on safety conditions.

Off-season water column monitoring may be performed at all, or a portion of, the same locations utilized for far-field monitoring, following the same general procedures. This monitoring will begin after dredging operations have been suspended for the year in the fall, and will continue until operations begin the following spring.

1.4.6.4 Quality-of-Life (QOL) Monitoring

This task involves monitoring of ambient air, noise, odor, opacity, light, and meteorological conditions to assess achievement of the Quality of Life (QoL) Performance Standards established by EPA for the Hudson River dredging project. Specific field tasks include the following:

Air Sampling: This task involves driving to designated project monitoring locations and setting up air sampling media at monitoring stations (low and high volume). Following a pre-determined period of time, employees will return to the sampling locations and remove a filter/foam sample from the air sampling device. The sample is then packaged and sent via express courier to an analytical laboratory for the required analyses.

- Noise Monitoring: This task involves driving to designated project monitoring locations and installing noise monitoring meters to measure noise levels at a specified location, to be determined on an as-needed basis. Typically the noise meters are set on a tripod and data is logged and downloaded onto a computer for specified time intervals.
- Odor Monitoring: This task involves driving to locations adjacent to the river and using a handheld hydrogen sulfide monitoring device to measure odor levels at a specified location, to be determined on an as-needed basis.
- Opacity Monitoring: This task involves driving to locations associated with construction/dredging activities and visually observing exhaust from specific pieces of equipment. This monitoring is performed on an as-needed basis.
- Light Monitoring: This task involves driving to designated project monitoring locations and using a handheld light monitoring device to measure light levels at a specified location, to be determined on an as-needed basis.
- Meteorological Monitoring: This task involves driving to the Sediment Processing Facility, connecting a computer to a meteorological tower, and downloading weather data from the tower.

1.4.6.5 Sediment Processing Facility Storm Water Treatment Discharge and Outfall Monitoring

This task involves the sample collection of processed discharge water from the Treatment facility or storm water from three outfall locations at the Sediment Processing Facility. The discharge samples are generally collected every day during which sediment is processed and water released (samples are collected using an ISCO composite sampler or as a grab sample taken directly from a sample port in the discharge piping). Depending on the outfall and specific discharge rates, grab samples are collected of overflowing water. The samples are transported to the Work Support Marina for packaging and shipped to an off-site laboratory for analysis (via express courier).

1.5 REMEDIAL DESIGN SUPPORT ACTIVITIES

A description of other investigative activities that may be performed prior to or during the course of operations is summarized in the following subsections. The descriptions of these potential field activities are general, since the specific field activities are described in more detail in various data collection work plans developed in support of the design and investigation efforts.

1.5.1 Engineering Data Collection

Potential support activities involving engineering data collection include debris and obstruction surveying, geotechnical characterization of sediments, sub-bottom physical characterization and backfill source material identification and characterization.

1.5.1.1 Debris and Obstruction Survey

In-river surveys may be conducted to identify the types and locations of debris and obstructions on the river bottom. This information would be used to evaluate river bottom conditions, which will be important in the RA dredging activities.

Debris and obstruction survey activities may employ a combination of on water geophysical techniques, including side-scan sonar, multi-beam sonar, sub-bottom profiling, use of a marine magnetometer, and/or use of a submerged video camera.

The field work associated with this activity will include use of survey vessels. In addition, a vessel may be used to collect underwater video via remote video equipment or underwater video may be collected using divers with video equipment. Divers will use standard self-contained underwater breathing apparatus (scuba) and/or snorkel equipment.

1.5.1.2 Geotechnical Characterization of Sediments

Geotechnical characterization of sediments may be conducted to supplement the geotechnical information obtained during the Sediment Sampling and Analysis Program (SSAP). These activities may include collecting additional sediment samples and submitting them for analysis of geotechnical parameters. The activities may also include other geotechnical tests.

The field work associated with this activity may include collecting sediment cores using vessels and equipment similar to those used for sediment coring activities, but also may include using other types of field equipment from the vessels to measure sediment properties in place.

1.5.1.3 Sub-Bottom Physical Characterization

Sub-bottom physical characterization may be conducted to learn more about the sub-bottom sediment, i.e., located below the sediment surface, in river areas designated for dredging. This characterization would provide geotechnical information on the makeup and integrity of the sub-grade conditions. This information may be used for developing the design for dredging, anchoring, spud setting, and the installation of other structures, e.g., sheet piling, deemed necessary for the remediation activities.

These sub-bottom physical characterization activities may include additional geophysical survey activities, e.g., sub-bottom profiling, and advancing soil borings into the river bottom to collect soil samples for laboratory analysis of geotechnical properties such as grain size, bulk density, and moisture content. The field work could consist of using the geophysical survey vessels and sediment coring procedure described above, as well as using barge-mounted drill rigs to collect deeper samples of underlying material.

1.5.1.4 Backfill Source Material Identification and Characterization

This task involved backfill source material identification and characterization activities for the design activities. For the most part, the field work for this activity has already been completed. However, additional field work may be necessary to identify supplemental sources. The field work would include collecting soil samples at potential borrow sources (some sources may be several miles from the river) and packaging and shipping the samples to laboratories for analytical testing.

1.5.1.5 Base-Mapping

This task involved developing a base map of the Upper Hudson River for the design activities. For the most part, the field work for this activity has already been completed. However, additional field work may be necessary to develop additional detailed mapping in certain areas, e.g., near shoreline areas, etc., where surveyors may collect location-specific survey data, i.e., horizontal and vertical coordinates, to develop mapping information. These efforts would be performed by documenting features by boat or walking on shore.

1.5.1.6 Habitat Assessment

Additional habitat assessment activities may be conducted for one of more of the following habitat types present within the Upper Hudson River ecosystem:

1. Unconsolidated river bottom habitats;
2. Aquatic vegetation beds;
3. Shoreline habitats (including maintained and natural shorelines); and

4. Wetland habitats, notably RFW habitat.

The data collection methods to be used for habitat assessment efforts would include:

- Using a boat for personnel transport to document field conditions;
- Conducting an underwater inspection using standard scuba and/or snorkel equipment;
- Collecting sediment samples using clear Lexan tubes to visually inspect sediments and obtain samples for laboratory analysis;
- Collecting submerged aquatic and wetland vegetation for laboratory analysis;
- Verifying field position using a differential global positioning system (DGPS);
- Visually identifying fringing wetlands and wetland sediment conditions;
- Visually identifying other riverine hydrogeomorphic subclasses of wetlands, if potentially impacted by dredging activities;
- Identifying and documenting the presence or signs of wildlife;
- Measuring light attenuation using hand-held instrumentation such as quantum sensors;
- Measuring river velocity using a hand-held velocity meter; and
- Documenting the shoreline using tape measure, inclinometer, video tape, and digital camera.

1.5.1.7 Cultural and Archaeological Resources Assessment

Additional cultural and archaeological assessment (CARA) activities will likely be conducted in certain areas during the Remedial Action to assess potential in-river or upland cultural or archaeological resources that may be impacted by dredging or related operations. CARA field activities may include sediment coring, side-scan surveys, bathymetric surveys, magnetometer surveys, test pit installation, and scuba diving and/or snorkeling for data verification and possible discovery of resources. The details of this work will be specified in work plans or reports submitted to EPA.

1.6 SCHEDULE FOR FIELD ACTIVITIES

The schedule for field activities will be discussed in the Remedial Action Work Plan for Dredging and Facility Operations to be submitted to EPA in conjunction with this RA HASP. Construction field activities will typically occur six days per week, between dawn and dusk. Dredging and processing operations will typically occur six days per week, 24 hours per day, with maintenance being performed on the seventh day.

SECTION 2

SITE SAFETY PERSONNEL

2.1 CONTACT INFORMATION FOR SITE SAFETY PERSONNEL

The project team shall implement a safety program that ensures the safety of all project employees, contractors, visitors, and others involved in the project. The site is defined as the processing/operations facility, rail yard, wharf, small craft marina and any river section where project related activities or equipment are involved, e.g., dredging, moving barge, etc. The names and contact information for lead site safety personnel are presented in Attachment A. As lead site safety personnel and phone numbers are added or changed during the course of RA activities, modifications to this list will be provided to EPA for posting at the USEPA's Hudson River Field Office. This information will be available in all areas where RA activities are taking place.

2.2 LEAD SITE SAFETY PERSONNEL

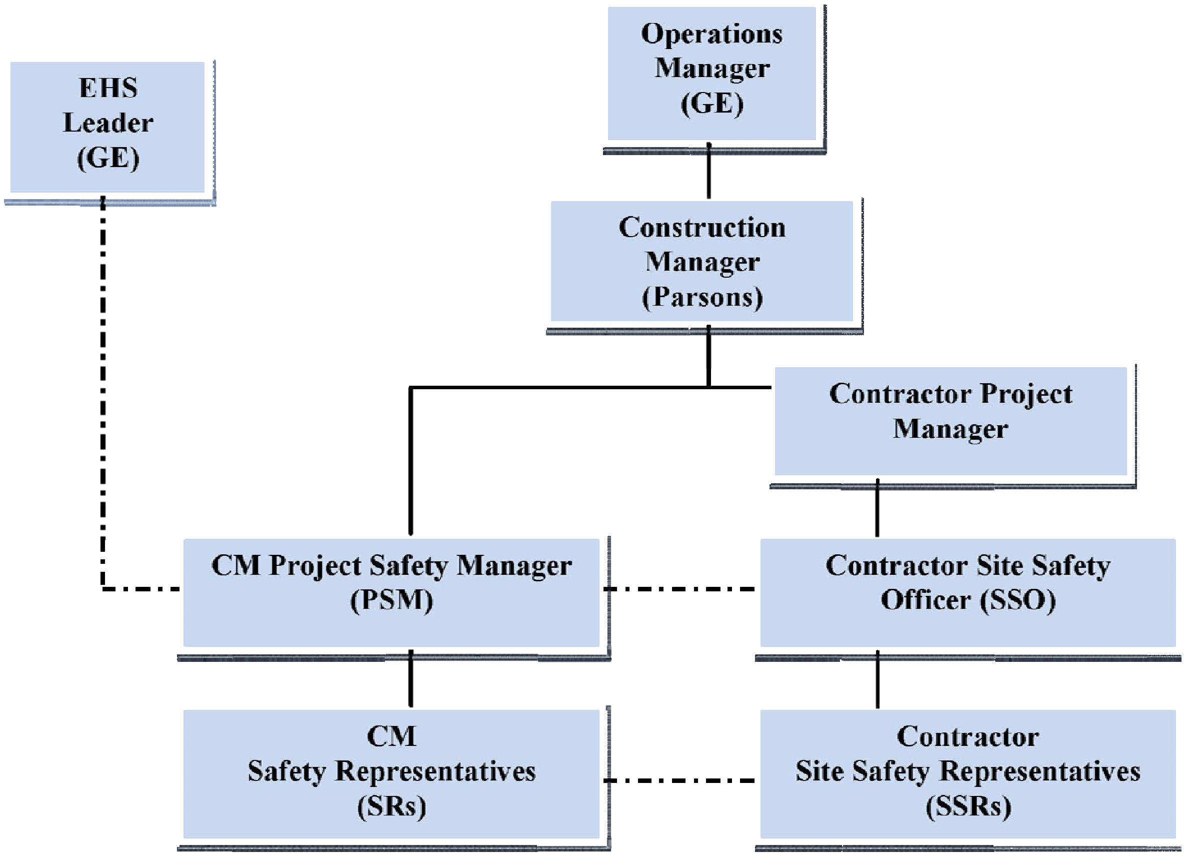
The following two organization charts outline the overall project safety organization and chain of command for the site safety personnel.

The roles of the lead site safety personnel — the CM project safety manager (PSM) and CM safety representatives — as they relate to the health and safety issues, are outlined below. The PSM will be supported by the different CM safety representatives, including SSRs, for each type of field activity.

The CM's role in implementing a safety program includes the following responsibilities:

- Provide leadership by demonstrating a personal commitment to safety at all times;
- Provide hands-on participation in the development and implementation of the RA HASP;
- Develop incentive/reward programs to recognize safety achievements;
- Establish a disciplinary program for unsafe behavior; and
- Meet safety targets.

RA HASP
PROJECT SAFETY ORGANIZATION



2.2.1 Safety Manager (for CM)

The CM PSM or designee will be available on site whenever field activities are occurring. The PSM will confirm that all site personnel are familiar with the provisions of this RA HASP and the 2011 CHASP; and that workers understand the hazards that they may encounter and the procedures for mitigating those hazards, e.g., safe work practices, and personal protective equipment (PPE). The PSM will also serve as the emergency response liaison and incident commander, in addition to being the primary contact with GE and regulatory agencies for health and safety issues. The roles and responsibilities of the PSM shall include but may not be limited to the following:

- Be the most visible leader for the project's zero incident safety culture and lead the jobsite in the belief that all incidents are preventable and a zero incidents goal is attainable;

- Will act as the incident commander for project emergencies that are handled internally. In the event of an emergency requiring external emergency response, the first responding agency's lead officer will become the incident commander when he or she arrives on site. The PSM will serve as liaison to the external incident commander, as appropriate;
- Ensure preparedness for emergency responses to incidents and that project personnel are adequately trained in the emergency response plan procedures;
- Inform appropriate authorities and response agencies in the event of a spill that poses a potential hazard to the public;
- Release a Stop Work order after the conditions that initiated the order are corrected. The CM construction manager will issue an authorization to proceed after receipt of the release from the PSM and any other required conditions have been met;
- Maintain, update, and implement the RA HASP;
- Approve any changes to the RA HASP due to modifications of procedures or newly proposed site activities;
- Ensure that personnel assigned to the project have appropriate training certifications and medical clearance;
- Ensure controlled substance and alcohol testing is completed for all workers prior to starting work;
- Assess site security and control procedures that address the health and safety of the public and non-authorized personnel who may visit the work sites;
- Work with GE's health and safety personnel to inform personnel of any site-specific practices and procedures that must be followed in addition to the provisions of this RA HASP;
- Display leadership in all RA HASP activities and confirm regulatory compliance by subordinates/team members;
- Coordinate with the SSRs on matters relating to work site activities, ongoing and/or planned, to verify that adequate consideration is given to maximum employee health and safety protection and compliance with applicable local, state, and federal regulations;
- Consult with SSRs and project team members on matters relating to suspending site activities in the event of an emergency; and
- Verify that corrective actions resulting from deficiencies identified by audit and observation are implemented and effective. Reviews are conducted regularly; deficiencies, if any, are identified; issues are tracked to closure; improvements are made to prevent potential hazards; and mitigation measures are implemented as a result of these reviews.

Audits will include the inspection and assessment provisions set forth above, as well as a brief summary report noting any deviations from this RA HASP and corrective actions that may be necessary to promote the health and safety of workers and the public.

While field activities are underway, the PSM will be either on site or available via cellular phone should an emergency arise. While off site, the PSM will designate an alternate — typically one of the CM SSRs — to be the primary point of contact for daily health and safety issues. This person will be identified during the daily health and safety briefings.

The PSM will work with the CM to address any community health and safety issues. The PSM will be a board-certified safety professional (CSP) or certified industrial hygienist (CIH), as well as will have completed Occupational Safety and Health Administration (OSHA) 40-hour hazardous waste operations (HAZWOPER) training (29 CFR 1910.120), additional 8-Hour HAZWOPER Supervisor Training and current eight-hour annual refresher. In addition, the PSM will have current training in first aid and cardiopulmonary resuscitation (CPR).

2.2.2 Safety Representatives (for CM)

CM safety representatives will be responsible for managing on-site health and safety activities and will provide support to the PSM on health and safety issues that relate to their tasks. Additional responsibilities for the CM safety representative include but shall not be limited to the following:

- Be a visible leader for the project's zero incident safety culture and carry out tasks with the belief that all incidents are preventable and a zero incidents goal is attainable;
- Implement the RA HASP;
- Suspend field work in an emergency or if unsafe work conditions exist;
- Review safety protocols and procedures, e.g., Job Safety analysis (JSA), as necessary for field work;
- Observe workers for signs and symptoms of chemical exposure, heat/cold stress, fatigue, etc.;
- Initiate emergency response plan procedures as necessary;
- Provide site-specific project orientation to field workers and verify that all personnel know who to contact and what to do in the event of an emergency at each work site;
- Perform and document periodic audits of compliance with health and safety procedures and work with contractors to address any deficiencies and develop solutions that are compliant and correctly address the safety concern;
- Follow-up and conduct investigations on all incidents and near-miss incidents, share conclusions and findings with workers during daily tool-box meetings, or initiate safety work stand-downs to communicate important findings;
- Ensure PPE is available for workers and ensure that workers are aware of the availability;

- Audit the health and safety practices and procedures within the work zones/areas on a continuous basis and work with contractor to adapt practices and procedures to changing circumstances (encourage the safety system to be a living and organic system that adapts to changes);
- Be a resource for leading the daily health and safety briefings and encourage personnel to raise safety concerns. Work with individuals to address any specific health and safety issues that may be raised at the meetings and ensure that they are aware that they can refuse to do unsafe tasks or activities and that they can do so without fear of reprisal or dismissal (otherwise known as their "stop work authority");
- Inspect the site work zones/areas, i.e., construction, processing/operations, dredging, to verify that adequate hazard communication measures are in place; and
- Inspect the site work zones/areas to verify that proper procedures are in place and are being followed for decontamination and that the support zone (SZ), contaminant reduction zone (CRZ), and exclusion zone (EZ) are clearly delineated.

CM safety representatives involved with the processing facility or dredging operations will have completed the required OSHA 40-hour HAZWOPER training (29 CFR 1910.120) and current eight-hour annual refresher. CM safety representatives involved with the construction of the processing facility or rail yard will have a 30-hour OSHA construction safety certification, or certification as a CSP or construction health and safety technician (CHST). CM safety representatives involved with the processing or dredging operations will have a 30-hour OSHA construction safety certification, or certification as a CSP, CIH, or occupational health and safety technician (OHST). In addition, all CM safety representatives will have current training in first aid and CPR.

Additional responsibilities of the CM PSM, safety representatives, and site supervisors related to emergency response are described in Section 10.

2.2.3 Site Safety Officer / Site Safety and Health Officer (for Contractor)

Contractor SSO or SSHO will be responsible for all on-site health and safety activities that relate to their scope of work, and will have the authority to suspend such activities in the event of an emergency or unsafe working conditions. The SSO or SSHO will be the primary point of contact for all field personnel and visitors observing field activities, and has direct responsibility for the implementation and administration of the contractor's RA HASP. Specifically, the SSO or SSHO will be responsible for the following:

- Be a local leader for the project's zero incident safety culture and lead their workers in the belief that all incidents are preventable and a zero incidents goal is attainable;
- Enforce all health and safety rules and regulations within the scope of this RA HASP;
- Lead the daily health and safety briefings and encourage personnel to raise safety concerns and then work with them to address any specific health and safety issues that may be raised at those meetings;

- Ensure that the workers are aware that they can refuse to do unsafe tasks or activities; and that they can do so without fear of reprisal or dismissal (otherwise known as their "stop work authority");
- Conduct and document health and safety audits;
- Coordinate with the PSM and the CM safety representative on matters pertaining to project health and safety;
- Evaluate field activities to detect unsafe acts and conditions and develop solutions that address the root cause of the unsafe act or condition;
- Educate employees regarding the zero incident safety culture, applicable work practices, procedures, rules, and regulations;
- Be a mentor, facilitator, and encourager of workers in being responsible for their own and their colleague's safety;
- Educate employees on applicable emergency contingency plans;
- Report all incidents and injuries to the project manager, PSM, and appropriate safety representative; and
- Share with project manager, PSM, and appropriate safety representative safety accomplishments, solutions, and achievements, so that they can be passed onto other parts of the project.

Contractor SSO or SSHO will also be available to assist in addressing community health and safety issues.

The SSO involved with construction activities shall have a minimum of 10 years of safety experience of a progressive nature with at least 5 years of experience on similar projects, will have completed the required OSHA 40-hour HAZWOPER training (29 CFR 1926.65), additional eight-hour HAZWOPER supervisor training, and current eight-hour annual refresher (for activities involved with PCB-impacted sediments) and shall possess one of the following certifications:

- CSP
- CHST

The SSHO involved with processing and dredging activities shall have a minimum of 10 years of safety experience of a progressive nature with at least 5 years of experience on similar projects, will have completed the required OSHA 40-hour HAZWOPER training (29 CFR 1910.120), additional eight-hour HAZWOPER supervisor training, and current eight-hour annual refresher and shall possess one of the following certifications:

- CSP
- CIH
- OHST

The SSO or SSHO involved with monitoring and design activities shall have a minimum of 10 years of safety and project experience of a progressive nature with at least 5 years of experience on similar projects, will have completed the required OSHA 40-hour HAZWOPER training (29 CFR 1926.65), additional eight-hour HAZWOPER supervisor training, and current eight-hour annual refresher (for activities involved with PCB-impacted sediments).

2.2.4 Site Safety Representative (for Contractor)

A SSR involved with construction activities shall have a minimum of five years of safety experience of a progressive nature with at least two years of experience on similar projects, and will have completed a 30-hour OSHA Construction Safety course or equivalent. Each SSR involved with construction activities shall have formal documented safety training for competent person status for the following 7 areas of competency, based on the Contractor scope of work and the SSRs assigned responsibility:

- Excavation (29 CFR 1926 Subpart P);
- Scaffolding (29 CFR 1926 Subpart L);
- Fall protection (29 CFR 1926 Subpart M);
- Manlifts (29 CFR 1910 Subpart F);
- Material Handling (29 CFR 1910 Subpart N);
- Hazardous energy (29 CFR 1910.147);
- Confined space (29 CFR 1910.146); and
- Hazardous Waste Operations and Emergency Response (29 CFR 1926.65).

All SSRs involved with processing and dredging activities shall have a minimum of 5 years of safety experience of a progressive nature with at least 2 years of experience on similar projects, will have completed the required OSHA 40-hour HAZWOPER training (29 CFR 1910.120), and current eight-hour annual refresher and have completed a 30-hour OSHA Construction Safety course or equivalent. Each SSR will also have formal documented safety training for competent person status for at least the following five areas of competency:

- Hazardous Waste Operations and Emergency Response (29 CFR 1910.120);
- Personal Protective Equipment (29 CFR 1910 Subpart I);
- Machinery and Machine Guarding (29 CFR 1910 Subpart O);
- Commercial Diving Operations (29 CFR 1910 Subpart T), and
- Materials Handling and Storage (29 CFR 1910 Subpart N).

The SSRs involved with habitat construction will have formal documented safety training for competent person status for at least the following areas:

- Commercial Diving Operations (29 CFR 1910 Subpart T); and
- Hazardous Waste Operations (29 CFR 1910.120).

All SSRs involved with monitoring and design activities shall have a minimum of five years of safety and field experience of a progressive nature with at least two years of experience on similar projects, will have completed the OSHA 40-hour HAZWOPER training (29 CFR 1910.120), and current eight-hour annual refresher. Each SSR involved with monitoring and design activities shall have formal documented safety training for competent person status for the following 4 areas of competency, based on the Contractor scope of work and the SSR's assigned responsibility:

- Material Handling (29 CFR 1910 Subpart N);
- Personal Protective Equipment (29 CFR 1910 Subpart I);
- Confined Space (29 CFR 1910.146); and
- Hazardous Waste Operations and Emergency Response (29 CFR 1926.65).

Contractors shall provide at least two individuals current in CPR/first aid training for each work area during every shift, including each individual manned barge/dredge. Where an automated external defibrillator (AED) is required in a work area or dredge, at least two individuals per shift per AED equipped work area or dredge must be trained in its use. Each dredge plant operating on the river, each dive platform, and the size separation area, water treatment plant building, dewatering building and rail service building of the Processing Facility shall have an AED provided by the contractors. Training certificates are to be current when working on the project.

2.2.5 Project Workers

Every project worker on the jobsite (from GE management to Contractor worker) is responsible for safety. These responsibilities include:

- To commit to the project zero incident culture and to believe that all incidents are preventable and zero incidents are attainable;
- To exercise your "Stop Work Authority" by intervening if you see co-workers about to commit an unsafe act and to call a halt to any unsafe activity you witness;
- To participate in daily tool box meetings and to share opinions or ideas on better safe work practices;
- To adhere to the buddy system at all times;
- To follow all procedures identified in the RA HASP, Contractor HASP, or as may be communicated to you by supervisory staff;
- To be receptive to training in safer work practices; and
- To be tolerant towards your co-workers and open to their views and suggestions pertaining to safer work practices, even if they are different from what you are used to doing.

2.2.6 Processing/Operations Facility, Dredging, Habitat Construction, Monitoring and Design Personnel

All contractor and subcontractor personnel involved with the processing/operations facility, dredging operations or habitat construction that have the potential to be exposed to hazardous substances or health hazards will be required to provide proof of OSHA 40-hour HAZWOPER training (29 CFR 1910.120) and current refresher, and a written statement of medical clearance to wear a respirator. All personnel will be made aware of the provisions of this RA HASP and will be required to sign the HASP acknowledgment (Attachment B). This documentation will be maintained by each contractor subject to audit by the CM.

All contractor processing/operations facility, dredging, and habitat construction personnel working on the project who have the potential to be exposed to hazardous substances or health hazards will be required to have a medical evaluation certifying their physical fitness for hazardous waste site operations (29 CFR 1910.120(f)). At a minimum, this evaluation will comply with OSHA's Respiratory Protection Standard, 29 CFR 1910.134 and OSHA's Commercial Diving Operations (29 CFR 1910 Subpart T) requirements.

All project personnel will be required to attend the daily health and safety and project coordination meeting to be eligible to work on the site that shift. At this meeting, personnel will sign in with the site supervisor (or designee), who will verify the status of employee credentials and distribute the daily sign-in sheets to appropriate project personnel.

Contractors are responsible for the ultimate health and safety of their employees that will participate in RA work activities. This RA HASP represents the minimum acceptable health and safety standards to be followed on the project. Contractors shall develop a contractor HASP that mandates additional health and safety protection measures for their employees, which will be included as addenda to this RA HASP. Contractor employees associated with dredging, processing/operations and/or handling PCB-impacted sediments shall have medical examinations in compliance with 29 CFR 1910.120(f), and as required based upon the substances that the employees will or could be exposed to. Contractor employees required to wear a respirator shall be trained, medically qualified and fit tested on an annual basis as per 29 CFR 1910.134.

SECTION 3

SITE LAYOUT AND CONTROL PLAN

3.1 GENERAL

The Hudson River is located in eastern New York State and flows approximately 300 miles in a generally southerly direction from its source, Lake Tear-of-the-Clouds in the Adirondack Mountains, to the Battery, located in New York City at the tip of Manhattan Island. The Upper Hudson River (UHR) is defined as the section of river upstream from the Federal Dam in Troy, New York.

The Upper Hudson River is divided into three sections (River Section 1, River Section 2, and River Section 3) for the sediment remediation activities. The location of each section is described below and presented on the Site Location Map included as Figure 1:

- **River Section 1:** From the former location of the Fort Edward Dam to Thompson Island Dam (approximately 6.3 miles).
- **River Section 2**: From the Thompson Island Dam to the Northumberland Dam (approximately 5.1 miles).
- **River Section 3**: From the Northumberland Dam to the Federal Dam at Troy (approximately 29.5 miles).

3.1.1 Sediment Processing Facility

The Sediment Processing Facility is located between the Champlain Canal (approximately 1.9 miles north of Lock 7) and the main Canadian Pacific rail line in Fort Edward, New York. The purpose of the Sediment Processing Facility is to offload debris and sediment from barges, separate debris and coarse material from the dredged sediment, mechanically dewater the fine-grained sediment prior to shipment of the sediment off site to a landfill, and treat water generated from stormwater and dewatering activities. Figure 3 is a layout of the processing facility, e.g., processing areas, the barge unloading area, and the rail yard, which will be fenced and gated on all non-water sides.

The Sediment Processing Facility is accessed via a two-mile access road that connects the existing truck route on New York State Route 196 in the Town of Kingsbury, New York, to the northern boundary of the facility (Main Access Road). During an emergency, the Main Access Road will be supplemented by the East Access Road, which is located along the southern boundary of the site and connects to East Street in Fort Edward. The Sediment Processing Facility is fenced and gated on all non-water sides. Chain link fencing has also been installed around certain interior portions of the Sediment Processing Facility to restrict unauthorized access. Entry points are either locked or staffed by security personnel to restrict access and minimize potential public trespass.

Entry points will either be locked or staffed by security personnel to restrict access and minimize potential public trespass. Access to the Work Support Marina will be via a single access road off of West River Road. Anyone wishing to enter the site will be required to inform the security guard the purpose of the visit and the name of a project contact person (if applicable). Workers will be provided with personal ID badges to access either the facility site, support marina or both. The security guard will also have a list of project personnel with phone numbers or radio contact information. If an individual attempting to enter the site does not have a personal ID badge, then the security guard will notify the appropriate project personnel for site access approval. Workers and visitors authorized to access the site must show proper identification and sign in and out. Visitors authorized to access the site shall be escorted by project personnel at all times.

3.1.2 Moreau Barge Loading Area

The Moreau Barge Loading Area is located on the west shore of the Hudson River at approximately RM 194 in the town of Moreau off West River Road (County Road 29). It is accessed via Highway 197 west from Fort Edward. The area is gated and enclosed, with fencing on all non-water sides. The stone and sand materials stored at the loading area are segregated into bins by large concrete blocks, and conveying equipment is also present on the site when it is in active use. Backfill material will be transported by barge to the designated areas for placement and shoreline stabilization as needed.

3.1.3 Work Support Marina

The Work Support Marina is located on the west shore of the Hudson River at approximately River Mile (RM) 193.7 (across from the southern tip of Rogers Island). The Work Support Marina is accessed from West River Road (County Road 29) in the Town of Moreau and is not available for use by the public. Figure 1-4 presents a site layout of the Work Support Marina, which is also fenced and gated on all non-water sides. The Work Support Marina includes a parking lot for worker vehicles; a floating dock system consisting of a main floating dock, along with finger docks that provide berthing slips for smaller boats; and a security station. Temporary modular trailer offices for use by GE, the CM, the dredging contractor, the habitat construction contractor, consulting firms performing monitoring activities, and EPA representatives are located at the facility, as well as a dedicated vessel traffic control center to monitor and coordinate vessel movements.

3.1.4 General Support Property

The General Support Property is located on the east shore of the Hudson River at approximately RM 192.5 and approximately 3 miles south of Fort Edward and is accessed via Route 4. The General Support Property was established to provide an equipment staging and support area for the dredging project. It serves as a support area for maintenance of the dredging equipment during the dredging season, and it is used to store marine equipment, e.g., Flexi-floats, tugboats, dock parts, during the off-season. The property is gated and locked.

3.2 RIVER WORK

Field work that requires using vessels in the river will be coordinated with the New York State Canal Corporation (NYSCC), which operates the Champlain Canal System; the United States Coast Guard (USCG), which has jurisdiction of the waterway; and work will also be overseen by USEPA or its designee. All vessels associated with the field activities will monitor marine band channel 13, as well as the project marine band channel. While performing field work within the designated navigational channel proper, the boats will provide signage to clearly denote the passing side. Vessels associated with the field activities will adhere to standard NYSCC and USCG navigation laws. Vessel movement will stop when visibility is below 500 feet, except barges, for which movement will stop when visibility is below 2,000 feet.

For field efforts that require the use of divers, appropriate protocols, e.g., dive flags and signs, will be used to alert boaters where diving operations are underway. A secondary method to monitor boater activity is required to protect divers, i.e. spotters, Dive plans have to be submitted to the CM and approved before any diving activity can take place.

The dredging contractor is required to develop a lock transit safety plan in conjunction with NYSCC to address safe lock passage procedures, potential lock and vessel contact and spills inside the lock area.

Contractors shall submit vessel safety inspections prior to being used on the project and monthly thereafter. Inspections forms shall comply with applicable regulations as determined by the size of the vessel.

Contractors shall comply with the Water Operations Permit, Float Plan and Field Activities Tracking Standard Operating Procedure (SOP) for any field activities within six feet of or on water bodies including rivers, streams, creeks, canals, storm water basins, and swamps. This SOP and associated forms are included in Attachment H.

SECTION 4

POTENTIAL HEALTH AND SAFETY HAZARDS AND CONTROLS

4.1 FIELD HAZARDS AND CONTROL MEASURES

The following sections discuss general safety and health hazards associated with the specific field activities of the RA Work Plans and support activities. The descriptions of these field activities are general, since the specific field activities will be described in more detail in the contractor HASP submitted by each contractor performing the work. Each contractor HASP will specify minimum procedures for controlling the hazards associated with the various field activities.

Minimum control measures and procedures to be used on the project are detailed in Section 4.2 – General Hazard and Control Measures. In this section, the overall guidelines on when and how to develop a job safety analysis (JSA) for specific tasks are discussed. Sections 4.3 through 4.23 specifically address procedures and control measures for water safety, lockout/tagout, (LOTO) fire prevention/hot work permits, confined space entry, fall protection, cranes, hoisting and rigging, scaffolding, electrical safety, hand/power tools, ladder safety, housekeeping, steel erection, diving safety, soft/hard line handling, heat stress, cold stress, biological hazards, safe lifting, PCBs, drilling operations, working on ice, electro-fishing, working on a bridge, and ionizing radiation.

All work must be performed using the buddy system, a system of organizing employees into work groups so that each employee of the work group is designated to be observed by at least one other employee in the work group. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency. If an individual in a work group does not have a direct line of sight with another group member, then the individual must have a means of communicating with the group, e.g., two-way radios.

4.1.1 Processing Facility Upgrades

Potential construction at the facility could include general civil site work and associated mechanical and electrical construction.. The construction activities may involve the installation of additional size separation equipment, connection of the system to the current piping, and the addition of electrical systems, controls and related accessories.

<u>Hazards</u>

The hazards associated with these activities can be physical, biological, and environmental.

Physical hazards include, but are not limited to:

- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;

- Coming in contact with electricity;
- Coming into contact with contaminated sediment (for in-river work below Lock 7) or hazardous materials;
- Drowning;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces; and
- Vehicle/train incidents.

Biological hazards include exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project site preparation may cause blisters, sore muscles, and joint and skeletal injuries; these activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site, based on the field activities taking place and potential releases to the environment.

4.1.2 Processing Facility Operations

During dredging, processing facility operations will occur 24 hours a day, six days a week, with the seventh day reserved for maintenance, make-up time for unplanned outages, or as a contingency to satisfy the productivity requirement. During the off-season, processing facility operations will be limited to general maintenance and water treatment plant operations, which will occur 8 hours a day, 5 days a week.

Dredged material will be unloaded from barges by a mechanical off-loader. Large debris will be separated and sized. The remaining sediment will be processed at the Size Separation

Area through a wobbler screen, trommel screen, Intermediate Screen and two hydrocyclone systems, which will separate the sediment into various sized coarse material, e.g., sand and gravel, and fine or silty material.

Coarse material from the Intermediate Screen and the Hydrocyclone system will be placed on a screen to remove excess water. Once Hydrocyclone underflow or sediment slurry has been conveyed to the gravity thickening area it will be mixed with polymers to enhance dewatering and then processed through filter presses for water removal.

Trucks will move processed coarse materials from the Size Separation area to the coarse material staging area on the property.

Water generated during sediment processing, along with rain that falls on material handling areas, is collected for on-site treatment. Once treated, the clean water is discharged into the Champlain Canal.

The processing facility operator will use a tow boat in addition to a barge indexing system to aid in the efficient movement of barges along the wharf.

Hazards

The hazards associated with these activities are mainly physical and environmental.

Physical hazards include, but are not limited to:

- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Coming in contact with electricity;
- Coming into contact with hazardous materials;
- Drowning;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces;
- Vehicle/train incidents;
- Working in trenches/excavations; and
- Work near radiological sources.

Environmental hazards include, but are not limited to, exposure to insects, animals, rodents, heat, cold, ultra-violet radiation, noise, and lightning.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site, based on the field activities taking place and potential releases to the environment.

4.1.3 Dredging Operations

Dredging of sediment will occur 24 hours a day, six days a week, with the seventh day reserved for maintenance and make-up time for unplanned project interruptions.

Environmental bucket dredges will be used. This type of mechanical dredging uses an enclosed bucket to capture the contaminated sediment. Tugboats and barges will transport the sediment to the dewatering facility.

After dredging, clean sand, gravel, or stone may be used as backfill or cap to cover some dredged areas. The clean backfill or cap materials will be transported from the staging areas to dredged areas via barge.

To minimize and control sediment resuspension, sheet piling and silt curtains may be installed in the river at some locations.

Hazards

The hazards associated with these activities are mainly physical and environmental.

Physical hazards include, but are not limited to:

- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Coming into contact with contaminated sediment or hazardous materials;
- Confined space hazards;
- Drowning;
- Hypothermia;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Marine vessel incidents;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces;

- Soft/hard line hazards; and
- Proximity to low head dams and similar structures.

Environmental hazards include, but are not limited to, exposure to insects, animals, rodents, heat, cold, ultra-violet radiation, high wind, river current, noise, and lightning.

Control Measures

In accordance with Section 5 in the Contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the Contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site, based on the field activities taking place and potential releases to the environment.

Exclusion zones must be established around areas on board the dredge, barges, and other support vessels where workers could incur contact with contaminated sediments. Such contact could result when the contaminated dredge bucket is placed on the deck of the dredge for storage, cleaning, or maintenance. Also dredge material spillage on the deck and gunwales of the material barges could be a source of exposure for the crew members. The dredging contractor will describe the exact locations of these exclusion zones and associated decontamination areas and support zones in their Contractor Health and Safety Plan.

4.1.4 Habitat Construction

The Phase 2 habitat construction shall consist of all activities related to the specified plantings in designated project areas. Divers with prescribed training and experience will carry out the habitat construction, following procedures intended to maximize protection of divers from accidental injury and/or illness.

Hazards

The hazards associated with these activities are mainly physical and environmental.

Physical hazards include, but are not limited to:

- Proximity to low head dams and similar structures;
- Being struck by tools/equipment/materials;
- Coming into contact with contaminated sediment or hazardous materials;
- Drowning;
- Hypothermia;
- Air embolism or other barotraumas;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;

- Marine vessel incidents; and
- Slips/trips/falls on same elevation surfaces.

Environmental hazards include, but are not limited to, exposure to insects, animals, rodents, heat, cold, ultra-violet radiation, high winds, river current, water temperatures, and lightning.

Control Measures

In accordance with Section 5 in the Contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site, based on the field activities taking place, hazards anticipated and potential releases to the environment.

Contractors engaged in commercial diving must develop a *Safe Practices Manual* for Commercial Diving. All diving operations must be conducted in accordance with 29 CFR 1910 Subpart T.

The diving contractor will also provide a task specific "Dive Plan" for each individual diving assignment that outlines the personnel roles and responsibilities, equipment, standard operating procedures, hazard controls, emergency procedures, etc., in accordance with 29 CFR 1910 Subpart T. Each Site Specific Dive Plan must be accepted by the CM before the diving operation can begin.

Contractor shall comply with the Water Operations Permit, Float Plan and Field Activities Tracking Standard Operating Procedure (SOP) for any field activities within six feet of or on water bodies, including rivers, streams, creeks, canals, storm water basins, and swamps. This SOP and associated forms are included in Attachment H.

4.1.5 Rail Yard Operations

At the staging area of the Sediment Processing Facility, dewatered sediment will be loaded into rail cars. The dewatered sediment will then be transported via rail to final destination(s).

Approximately 38,000 feet (just over seven miles) of railroad track has been installed to enable loading, maneuvering, repair, and inspection of rail cars. Rail may also be used for delivery of materials to the processing facility.

Hazards

The hazards associated with these activities are mainly physical and environmental.

Physical hazards include, but are not limited to:

- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Coming into contact with contaminated sediment or hazardous materials;

- Fall from elevation;
- Fatigue;
- Fires;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces; and
- Vehicle/train incidents.

Environmental hazards include exposure to insects, animals, rodents, heat, cold, ultra-violet radiation, noise, and lightning.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site based on the field activities taking place and potential releases to the environment.

4.1.6 Monitoring and Design Support Activities

Remedial action monitoring and design includes sediment sampling, Biota (fish) monitoring, water column, quality-of-life monitoring, processing facility stormwater treatment and discharge outfall monitoring, ecological studies, and waste characterization sampling.

Hazards

The hazards associated with these activities can be physical, biological, and environmental.

Physical hazards include, but are not limited to:

- Proximity to low head dams and similar structures.
- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Coming into contact with contaminated sediment (for in-river work below Lock 7) or hazardous materials;
- Drowning;
- Hypothermia;
- Electrical shock;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;

- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces;
- Vehicle/train incidents; and
- Marine vessel incidents.

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, water temperature, noise, and lightning.

Manual materials handling and manual project site preparation may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Work in close proximity to the river presents the possibility of drowning. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site based on the field activities taking place and potential releases to the environment. Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6, and those for diving safety are presented in Section 4.15 and Appendix C.

4.1.6.1 Sediment Sampling

Sediment sampling involves collecting samples at pre-determined locations along a grid system. The core samples will be collected from a boat equipped for core sampling using vibracoring or manual coring techniques.

Hazards

The hazards associated with these activities can be physical, biological, and environmental.

Physical hazards include, but are not limited to:

- Proximity to low head dams and similar structures;
- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;

- Coming into contact with contaminated sediment (for in-river work below Lock 7) or hazardous materials;
- Drowning;
- Hypothermia;
- Electrical shock;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces;
- Vehicle/train incidents; and
- Marine vessel incidents;

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, water temperature, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project work may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards from vessel, dock, and irregular walking surfaces on shore. Work in close proximity to the river presents the possibility of drowning. Rainy weather may cause wet, muddy, slick walking surfaces, and unstable soil. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site based on the field activities taking place and potential releases to the environment. Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6.

4.1.6.2 Biota (Fish) Monitoring

This task involves the collection of fish tissue samples from the Hudson River for chemical analysis of PCBs. The primary collection method for the fish monitoring is electrofishing from a vessel at a sampling location. An electrode attached to the boat extends down into the water, an electric current is transmitted from the electrode immobilizing any fish within range. The fish float to the river surface, staff then collects them with dip nets and places them in the live well of the boat.

Hazards

The hazards associated with these activities can be physical, biological, and environmental.

Physical hazards include, but are not limited to:

- Proximity to low head dams and similar structures.
- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Coming into contact with contaminated sediment (for in-river work below Lock 7) or hazardous materials;
- Drowning;
- Hypothermia;
- Electrical shock;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces, and
- Vessel incidents.

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include exposure to poisonous vegetation, insects, animals, rodents, heat, cold, water temperature, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project work may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards from vessel, dock, and irregular walking surfaces on shore. Work in close proximity to the river presents the possibility of drowning. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site based on the field activities taking place and potential releases to the environment. Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6.

4.1.6.3 Water Column Monitoring

Water sampling activities will be performed to monitor the in-river activities associated with dredging to assess achievement of the Engineering Performance Standards (EPS). The water column monitoring will include near-field and off-season water column monitoring, monitoring of discharges to the Hudson River and Champlain Canal (Land Cut above Lock 7).

Hazards

The hazards associated with these activities can be physical, biological, and environmental.

Physical hazards include, but are not limited to:

- Proximity to low head dams and similar structures;
- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Coming into contact with contaminated sediment (for in-river work below Lock 7) or hazardous materials;
- Drowning;
- Hypothermia;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces; and
- Vessel incidents.

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, water temperature, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project work may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards from vessel, dock, and irregular walking surfaces on or near shore. Work in close proximity to the river presents the possibility of drowning. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site based on the field activities taking place and potential releases to the environment. Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6.

4.1.6.4 Quality of Life (QOL) Monitoring

This task involves air sampling, noise, monitoring, odor, opacity, light, and meteorological monitoring to assess compliance with the QOL Performance Standards established by EPA for the Hudson River dredging project.

Hazards

The hazards associated with these activities can be physical, biological or environmental.

Physical hazards include, but are not limited to:

- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces; and
- High noise areas.

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project work may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards from equipment or irregular walking surfaces on or near shore. Work in close proximity to the river presents the possibility of drowning. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site based on the field activities taking place and potential releases to the environment. Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6.

4.1.6.5 Processing Facility Stormwater Treatment Discharge and Outfall Monitoring

This task involves the sample collection of processed discharge water from the Treatment facility or stormwater from three outfall locations at the Sediment Processing Facility. The discharge samples are generally collected every day during which treated water is discharged.

Hazards

The hazards associated with these activities can be physical, biological or environmental.

Physical hazards include, but are not limited to:

- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Drowning;
- Hypothermia;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces; and
- Vehicle incidents.

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, water temperature, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project work may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards from equipment or irregular walking surfaces on or near shore. Work in close proximity to the river presents the possibility of drowning. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required are to be available on site based on the field activities taking place and potential releases to the environment. Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6.

4.1.6.6 Ecological Studies

This task involves ecological studies in support of the project, including wildlife monitoring during both the summer and winter months, radio telemetry and avian monitoring. Field activities encompass access to stretches of the Hudson River. Observations and recordings will be made from vessels, walking along the river edge at selected areas for data collection, driving, and walking.

Hazards

The hazards associated with these activities can be physical, biological or environmental.

Physical hazards include, but are not limited to:

- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Drowning;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces;
- Vehicle incidents

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project work may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards from equipment or irregular walking surfaces on or near shore. Work in close proximity to the river presents the possibility of drowning. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site are based on the field activities taking place and potential releases to the environment. Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6,

4.1.6.7 Waste Characterization Sampling

This task includes collecting samples of soils/sediments and liquids from waste containers or material stockpiles to allow for characterization of waste materials for off-site treatment or disposal.

Hazards

The hazards associated with these activities can be physical, biological, and environmental.

Physical hazards include, but are not limited to:

- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Coming into contact with contaminated sediment or hazardous materials;
- Electrical shock;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces; and

- Vehicle/train incidents.

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project work may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards or irregular walking surfaces. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site based on the field activities taking place and potential releases to the environment. Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6.

4.1.7 Engineering Data Collection

These tasks involve potential support activities with engineering data collection including debris and obstruction surveying, geotechnical characterization of sediments, sub-bottom physical characterization and backfill source material identification and characterization.

Hazards

The hazards associated with these activities can be physical, biological, and environmental.

Physical hazards include, but are not limited to:

- Proximity to low head dams and similar structures.
- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Coming into contact with contaminated sediment (for in-river work below Lock 7) or hazardous materials;
- Drowning;
- Hypothermia;
- Electrical shock;
- Fall from elevation;

- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces;
- Vehicle/train incidents;
- Marine vessel incidents. and

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project work may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards or irregular walking surfaces. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site based on the field activities taking place and potential releases to the environment. Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6.

4.1.7.1 Debris and Obstruction Survey

This task includes in-river surveys that may be conducted to identify the types and locations of debris and obstructions on the river bottom. This information would be used to evaluate river bottom conditions, which will be important in the RA dredging activities.

Hazards

The hazards associated with these activities can be physical, biological, and environmental.

Physical hazards include, but are not limited to:

- Proximity to low head dams and similar structures.
- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;

- Coming into contact with contaminated sediment (for in-river work below Lock 7) or hazardous materials;
- Drowning;
- Hypothermia;
- Diving hazards;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces;
- Marine vessel incidents. and

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project work may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards or irregular walking surfaces. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site based on the field activities taking place and potential releases to the environment. Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6.

4.1.7.2 Geotechnical Characterization of Sediments

This task involves the geotechnical characterization of sediments that may be conducted to supplement the geotechnical information obtained during the Sediment Sampling and Analysis Program (SSAP). These activities may include collecting additional sediment samples and submitting them for analysis of geotechnical parameters. The activities may also include other geotechnical tests.

Hazards

The hazards associated with these activities can be physical, biological, and environmental.

Physical hazards include, but are not limited to:

- Proximity to low head dams and similar structures.
- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Coming into contact with contaminated sediment (for in-river work below Lock 7) or hazardous materials;
- Drowning;
- Hypothermia;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces;
- Marine vessel incidents. and

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project work may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards or irregular walking surfaces. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site based on the field activities taking place and potential releases to the environment. Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6.

4.1.7.3 Sub-Bottom Physical Characterization

This task involves sub-bottom physical characterization that may be conducted to learn more about the sub-bottom sediment, i.e., located below the sediment surface, in river areas designated for dredging. This characterization would provide geotechnical information on the makeup and integrity of the sub-grade conditions. This information may be used for developing the design for dredging, anchoring, spud setting, and the installation of other structures, e.g., sheet piling, deemed necessary for the remediation activities.

Hazards

The hazards associated with these activities can be physical, biological, and environmental.

Physical hazards include, but are not limited to:

- Proximity to low head dams and similar structures.
- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Coming into contact with contaminated sediment (for in-river work below Lock 7) or hazardous materials;
- Drowning;
- Hypothermia;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces;
- Marine vessel incidents. and

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project work may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards or irregular walking surfaces. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site based on the field activities taking place and potential releases to the environment. Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6.

4.1.7.4 Backfill Source Material Identification and Characterization

This task involved backfill source material identification and characterization activities for the design activities. For the most part, the field work for this activity has already been completed. However, additional field work may be necessary to identify supplemental sources. The field work would include collecting soil samples at potential borrow sources (some sources may be several miles from the river) and packaging and shipping the samples to laboratories for analytical testing.

Hazards

The hazards associated with these activities can be physical, biological, and environmental.

Physical hazards include, but are not limited to:

- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces;
- Vehicle incidents. and

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project work may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards or irregular walking surfaces. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site based on the field activities taking place and potential releases to the environment. Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6.

4.1.7.5 Base-Mapping

This task involved developing a base map of the Upper Hudson River for the design activities. For the most part, the field work for this activity has already been completed. However, additional field work may be necessary to develop additional detailed mapping in certain areas, e.g., near shoreline areas, etc., where surveyors may collect location-specific survey data, i.e., horizontal and vertical coordinates, to develop mapping information. These efforts would be performed by documenting features by boat or walking on shore.

Hazards

The hazards associated with these activities can be physical, biological, and environmental.

Physical hazards include, but are not limited to:

- Proximity to low head dams and similar structures.
- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Coming into contact with contaminated sediment (for in-river work below Lock 7) or hazardous materials;
- Drowning;
- Hypothermia;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation surfaces;
- Vehicle incidents;

- Marine vessel incidents. and

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project work may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards or irregular walking surfaces. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site based on the field activities taking place and potential releases to the environment. Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6.

4.1.7.6 Habitat Assessment

These tasks may involve taking additional habitat assessment activities for one of more of the following habitat types present within the Upper Hudson River ecosystem:

1. Unconsolidated river bottom habitats;
2. Aquatic vegetation beds;
3. Shoreline habitats (including maintained and natural shorelines); and
4. Wetland habitats, notably RFW habitat.

Hazards

The hazards associated with these activities can be physical, biological, and environmental.

Physical hazards include, but are not limited to:

- Proximity to low head dams and similar structures.
- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Coming into contact with contaminated sediment (for in-river work below Lock 7) or hazardous materials;
- Drowning;

- Hypothermia;
- Diving hazards;
- Fall from elevation;
- Fatigue;
- Fires;
- Lifting or carrying heavy materials;
- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation or uneven surfaces;
- Vehicle incidents;
- Marine vessel incidents. and

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project work may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards or irregular walking surfaces. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site based on the field activities taking place and potential releases to the environment. Section 4.3 presents safe work practices for working on and adjacent to the river. Control measures for boating safety are presented in Sections 4.3 and 8.6.

4.1.7.7 Cultural and Archaeological Resource Assessment

These tasks include additional cultural and archaeological assessment (CARA) activities which will likely be conducted in certain areas during the Remedial Action to assess potential in-river or upland cultural or archaeological resources that may be impacted by dredging or related operations. CARA field activities may include sediment coring, side-scan surveys, bathymetric surveys, magnetometer surveys, test pit installation, and scuba diving and/or snorkeling for data verification and possible discovery of resources. The details of this work will be specified in work plans or reports submitted to EPA.

Hazards

The hazards associated with these activities can be physical, biological, and environmental.

Physical hazards include, but are not limited to:

- Proximity to low head dams and similar structures.
- Being caught in/between/under equipment or materials;
- Being struck by tools/equipment/materials;
- Coming into contact with contaminated sediment (for in-river work below Lock 7) or hazardous materials;
- Drowning;
- Hypothermia;
- Diving hazards;
- Fall from elevation;
- Fatigue;
- Fires;
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- Pulling or pushing objects and materials;
- Slips/trips/falls on same elevation or uneven surfaces;
- Vehicle incidents;
- Marine vessel incidents. and

Biological hazards include, but are not limited to, exposure to dead animals, organic wastes, and contaminated soil and water that can harbor parasites and pathogens.

Environmental hazards include, but are not limited to, exposure to poisonous vegetation, insects, animals, rodents, heat, cold, ultra-violet radiation, noise, and lightning.

Manual materials handling and manual project work may cause blisters, sore muscles, and joint and skeletal injuries. These activities may also present eye, overhead, contusion, and laceration hazards. The work area may present slip, trip, and fall hazards or irregular walking surfaces. Rainy weather may cause wet, muddy, and slick walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces.

4.2 GENERAL HAZARDS AND CONTROL MEASURES

General safety and health hazards are associated with the field activities of the RA work plan and support activities. In addition to the site-specific requirement identified in this RA HASP, the contractor shall also comply with GE's Environmental, Health and Safety (EHS) Requirements described in Appendix B. As per Sections 5 and 6 of the contractor RA HASP, contractors are required to conduct a JSA for all aspects of their work. The JSA consists of the following three steps:

- Identify the task and break it down into steps;
- Identify the hazards associated with each step; and
- Identify the specific hazard control measure used for each step in accordance with the order-of-precedence method of control.

Below are some sample questions to aid the contractor in completing JSAs. This list is not comprehensive because each portion of the project, i.e., construction, processing/operations, dredging, monitoring, and design, has its own requirements and environmental conditions. The person developing the JSA should also consider taking photographs of the work area for a more detailed analysis of the work environment.

- Are there materials on the ground/floor that could trip a worker?
- Is lighting adequate?
- Are there any live electrical hazards at the jobsite?
- Do any tools, including hand tools, machines, and equipment, need repair?
- Is there excessive noise in the work area that could hinder worker communication and increase the risk of hearing loss?
- Is fire protection equipment readily accessible and have employees been trained to use it?
- Are emergency exits clearly marked?
- Are operators required to have a certificate or a license?
- Are trucks or motorized vehicles equipped with brakes, overhead guards, backup signals, horns, steering gear, and identification, as necessary?
- Are employees who operate vehicles and equipment trained and authorized?
- Are employees wearing the PPE required for the jobs they perform?
- Have any employees complained of headaches, breathing problems, dizziness, or strong odors?
- Is ventilation adequate?
- Does the job involve entry into a confined space?
- Are permits required for hot work, confined space work, or similar work?
- Are workers wearing clothing or jewelry that could get caught in machinery?
- Are workers provided and trained in the use of personal protective equipment appropriate to activities, e.g., hard hats, sturdy footwear, eye protection, hearing protection, etc.?
- Are there fixed objects such as sharp machine edges that could cause injury?
- Can workers get caught in or between machinery?
- Can reaching over moving machinery or materials injure workers?
- Is a worker in an off-balance position at any time?

- Is a worker's position in relation to a machine or equipment potentially dangerous?
- Is a worker required to make movements that could cause hand or foot injury, repetitive motion injuries, or strain from lifting?
- Can an object come loose and strike the worker?
- Do suspended loads or potential energy — compressed springs, hydraulics or jacks — pose hazards to workers?
- Are there guardrails in place to prevent a fall from one level to another?
- Can a worker be injured by lifting or carrying heavy objects?
- Do environmental hazards, e.g., dust, chemicals, radiation, welding rays, heat or excessive noise, result from performing a job or activity?
- Are work positions, machinery, pits or holes, and hazardous operations adequately guarded?
- Are lockout procedures for machinery deactivation used during maintenance procedures?
- Is the work flow improperly organized, e.g., is a worker required to make movements that are too rapid?
- How are dust and chemicals dispersed in the air?
- What are the sources of noise, radiation, heat, and cold?
- Will a worker come in contact with sharp surfaces?
- Are there guards in place to prevent an employee from reaching into moving machinery?
- Is there a risk of drowning?
- Will the individual be exposed to increased atmospheric or hydrostatic pressures?
- Will people intentionally be entering the water?
- Will the water be moving? If so, how fast is allowable?
- How deep is the water?
- Is work being conducted in proximity of a low head dam or similar structure?
- Are there any other downstream hazards?

In addition, the contractor shall use the following list as a guide in determining the construction activity hazards analyses for various high-hazard operations and critical tasks.

- **Pre-mobilization inspection.** Conduct an initial site inspection for pre-work planning. The inspection should cover potential exposures such as the location of electrical lines, underground utilities, nearby structures, traffic conditions, site security needs, public exposures general liability, and other potential exposures.

- **Water, wastewater, and marine work.** Analyze work adjacent to, in, or over water, including lakes, canals, dams, treatment plants, water tanks, clarifiers, and reservoirs, for hazards.
- **Traffic controls.** Plan the traffic controls for delivery of equipment or materials as well as any equipment operations. Control measures include warning signs, flagmen, traffic stoppage and control, and unloading procedures.
- **Material storage.** Consider where materials and equipment will be stored on site. Implement measures to protect against vandalism and theft of tools, equipment, or materials. Also consider the hazards that may exist for workers when they are storing or retrieving those materials.
- **Material handling.** Consider the size and weight of loads, the equipment to be used, how the equipment is set up and protected, and safety and maintenance inspections of material handling and rigging equipment. Also consider employee training in the use of the equipment or personal body mechanics when engaged in manual material handling activities.
- **Heavy equipment controls.** Evaluate the use of heavy equipment in operations such as site clearing, grading, and excavation or lifting. Controls should include equipment alarms, use of qualified operators, pre-use inspections, and any specific OSHA regulatory requirements.
- **Fall protection.** Safety harnesses and secured safety lanyards or retractable lifelines must be used when working from unguarded work surfaces where falls greater than 6 feet/1.8m present a hazard.

  Lanyards or retractable lifelines must be secured to separate lifelines and independent connection points capable of withstanding the load of a potential fall.
- **Steel erection.** Subcontractors erecting steel must comply with applicable regulations of OSHA 1926.750 and the Steel Erection Negotiated Rule Advisory Committee (SENRAC).
- **Personal protective equipment.** Consider operations where PPE is required and the type of PPE required, e.g., eye, head, foot, respiratory, hearing and hand protection, types of special protective clothing, and thermal protection.
- **Portable hand and power tools.** Evaluate the tools to be used and the ways that workers are protected from the hazards associated with the use of tools. Consider tool maintenance requirements; electrical requirements; the use of ground fault circuit interrupters, grounding, extension cords, and tool inspection procedures; and employee training and PPE requirements.
- **On-site traffic.** Internal traffic control plans should include ways to restrict the number of vehicles on site, the flow of vehicles through the site, haul roads, speed controls, subcontractor employee parking areas, merging of site traffic with local

vehicle traffic, pedestrian controls in traffic zones, access by emergency and rescue vehicles, and operator controls.

- **Employee training.** Always review the safety training needs of employees. Training should include initial site safety orientations and chemical hazard communication training. Some operations, e.g., excavation, blasting, scaffold erection, tunneling, confined space, operating heavy equipment, and working in highly hazardous plant process operations, may require special training that should be checked and evaluated.
- **Confined spaces.** Confined space work requires special consideration, evaluation, and controls. Each space should be reviewed for regulatory compliance.
- **Crane operations.** Consider special requirements for operations, maintenance, and heavy lifting operation. All lifts must be planned in accordance with the limitations of cranes being used.
- **Excavations and trenching.** These activities require complete analysis of existing underground exposures, soils, sloping and shoring methods, equipment, and engineering if depth of trench or excavations exceeds four feet. A JSA is recommended for all trenching operations.
- **Concrete formwork and placement.** Adequate access, ingress and egress, to elevated concrete work is essential to the safe and quality placement of concrete work. Work involving concrete should consider protective measures such as staging, platforms, handrails, and other passive forms of employee protection.
- **Process safety management.** At process sites where highly hazardous chemicals are stored or used, comply with special considerations and process safety management OSHA regulations.
- **Mechanical, electrical, and piping.** Evaluate all work associated with the installation, repair, and maintenance of mechanical, piping and electrical work for interferences, LOTO, line break procedures, and applicable customer requirements.
- **Hazard communication.** A site-specific hazard communication plan is required to be developed by the contractor. A copy of a material safety data sheet (MSDS) for each chemical brought to the site will be maintained by the Contractor with a copy sent to the CM. Containers will meet the National Fire Protection Association (NFPA) standards for storage. Labels on containers will be visible and readable.
- **Diving Operations.** A site specific Diving Safety Plan is required to be developed by the contractor. This will include information as required by OSHA for Commercial Diving and Operations (29 CFR 1910 Subpart T) and Consensus Standards for Commercial diving and Underwater Operations prepared by the Association of Diving Contactors International (ADCI).

Other requirements during RA activities include the following:

- Alcoholic beverages, recreational drugs, and people under the influence of these substances are not permitted on site.
- Weapons and firearms are strictly prohibited.
- No food or drink will be allowed in the construction work area except in the designated eating area.
- Music radios/headsets are prohibited.
- No cameras or video equipment are permitted on site except as necessary to document the progress of the work and as may be allowed under the specific site security guidelines.
- Smoking is not permitted in any building, including the building footprint and roof. Smoking is allowed in designated areas only.
- Horseplay and fighting is prohibited.
- Barricaded or roped off areas are considered danger zones and should be respected as such. Admittance to such areas is prohibited without authorization.
- Protect floor openings by providing adequate barricades and secured covers. All covers must be painted with high visibility paint or shall be marked with the word “HOLE” or COVER” to provide warning of the hazard.
- No one will be allowed to enter the site without proper identification. All trade workers, vendors, and visitors must comply with the CM’s badge and access program.
- Do not prop open exit doors.
- Throwing or dropping materials from one level to another is prohibited.
- No toxic chemicals or other types of pollutants may be disposed of in the on-site sewerage systems, either storm or sanitary.
- All gas cans and other liquid chemicals must remain in secondary containment devices.
- Riding in the back of pick-up trucks is prohibited.
- Park in designated contractor parking areas. The driver of any motor vehicle on company property is responsible for its safe condition and use. The vehicle owner must promptly correct any malfunction of brakes, lights, horn, or exhaust system. The driver is required to have a valid driver’s license and the vehicle must have a valid license plate. All traffic rules must be obeyed, and pedestrians have the right of way at the site.
- All deliveries and use of special equipment will be through areas designated by the CM. The CM will designate staging and storage areas for construction use. All contractors must schedule and coordinate deliveries in order to minimize the necessity of storing materials prior to installation.

- Talking on cell phones or using music headsets while operating project equipment is prohibited.

4.3 WATER SAFETY

Contractor personnel working over, near or adjacent to water, or where the danger of drowning exists, must wear a United States Coast Guard (USCG)-approved Commercial Type I, II, or III personal flotation device (PFD), appropriate to the circumstance. Other Types of USCG-approved PFDs must be approved by the CM prior to their use. The PFD shall be equipped with an attached emergency whistle and a light that is activated when submerged in water. PFDs shall be capable of rolling over an unconscious person to ensure that they will float face up. All PFDs shall be colored “International Orange” and will have SOLAS-grade reflective panels. Self-inflating PFDs will not be allowed on the project. Prior to and after each use, the PFD must be inspected for defects that would alter their strength and buoyancy. Defective units must be removed from service. This section pertains to personnel intending to work above the water surface, not divers who are actively engaged in diving operations (including dressing in and out of their gear).

Ring buoys with at least 90 feet of line must be provided and readily available for emergency rescue operations. Distance of working personnel from ring buoys may not exceed 200 feet. Some means of rescue, e.g., a ring buoy or boat, must be immediately available at locations where personnel are working over or adjacent to water.

Employees walking or working on the unguarded decks of barges, support vessels, floating platforms, and piers or docks shall wear a USCG-approved personal flotation devices. Fall protection shall also be provided if there is a possibility that persons could fall six or more feet to a lower level, deck, tethered vessel, water or dock/pier.

The operator/skipper of each boat must complete a USCG boating safety training course prior to conducting work on the river or canal. Each operator/skipper must demonstrate proficiency in the following subject areas: proper operation of a boat; boat and safety equipment inspections; content and frequency of equipment safety inspections; proper use of on-board safety equipment, including fire extinguisher, radio or cellular phone, flares, horn, etc.; proper procedures on the completion and filing of a float plan; appropriate boating “rules-of-the-road”; emergency procedures in the event of capsizing or being thrown overboard; and different types of PFDs and their proper inspection and use.

Prior to each day or shift of boat operations, a boat inspection must be conducted by the boat operator/skipper. This inspection must be conducted in accordance with accepted USCG and any applicable state boating safety inspection procedures. The inspection must verify that necessary safety equipment is aboard and functioning properly, and that all members of the crew are aware of proper procedures that are to be followed upon the water. In addition, this information must be reviewed during the daily toolbox safety meeting to confirm that the procedures have been followed and all crew members are satisfied as to its completion.

It will be the responsibility of the site supervisor and vessel captain to verify that daily boat/PFD/equipment inspections are completed and documented using a checklist, and daily toolbox safety meetings are conducted and documented.

Contractors shall comply with the Water Operations Permit, Float Plan and Field Activities Tracking Standard Operating Procedure (SOP) for any field activities within six feet of or on water bodies including rivers, streams, creeks, canals, storm water basins, and swamps. This SOP and associated forms are included in Attachment H.

Each vessel shall have established areas to use for embarkation and debarkation to reduce the potential for slips and fall when transferring from one vessel to another.

4.3.1 Low Head Dams

Dredging, habitat construction and support activities will be conducted upstream of low-head dams. A total of seven low-head dams are located within the project area. Consult the NYSCC charts for dam locations prior to any work activities on the river.

Hazards

The low-head dam is one of the most dangerous river concerns and can be a threat to an unwary boater, swimmer or wader. Hazards exist not only from going over the dam, but also from being caught in the backwash below the dam, the hydraulic, where the power of the water is sometimes overlooked. Anything caught in this backwash below the dam is trapped and recirculated round and round, making escape or rescue difficult. A person caught in the backwash of a low-head dam in certain flows will be carried to the face of the dam, where water pouring over it will wash the victim down under and back beneath the boil. When the victim struggles to the surface, the backwash again carries the victim to the face of the dam, thus continuing the cycle.

These dams are sometimes loaded with debris, such as tires and logs on the surface and rocks and steel bars on the bottom, posing another serious problem for the recirculating victim. Dams do not have to have a deep drop to create a dangerous backwash. During periods of high water and heavy rains, the backwash current problems get worse, and the reach of the backwash current is extended downstream.

Faces of a low-head dam are nearly vertical and their concrete surfaces are smooth. A person trapped against the dam face is unlikely to climb it. Water pouring over the dam will be highly aerated. The presence of these bubbles reduces buoyancy by a third and reduces the effectiveness of Personal Flotation Devices.

Control Measures

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. Also included will be applicable procedures to mitigate known risks or hazards, such as emergency equipment or supplies required to be available on site based on the field activities taking. To eliminate the threat of going over a dam, all personnel must follow the control methods listed below:

- Pre-trip planning is required by consulting published topographic maps of your river route. Consult NYSCC charts for dam locations.
- No work in the river, including work in the vicinity of a low-head dam, may be undertaken without first submitting a Water Operations Permit for CM approval.
- Low-head dams are difficult to see and do not look dangerous while approaching them from upstream. Watch for a smooth horizon line where the river meets the sky.
- Be alert for warning signs, markers or buoys and keep well clear of low-head dams.
- Look for concrete retaining walls along a river bank that can give the presence of a dam away.
- Navigation downstream of dam warning buoys, markers and signs is not permitted without prior written authorization from the CM. Warning buoys, markers, and signs are in place from May into November during the NYSCC operating season.
- Float Plans are to be completed daily for each vessel in operation. All sections of the Float Plan are to be completed by the vessel captain. A copy is to be reviewed with all crew and passengers prior to leaving the dock. When the vessel is off the water for the day, a notification by the vessel captain to the CM is required (e-mail or phone call to the CM) that the vessel and passengers are safely ashore.

4.4 LOCKOUT/TAGOUT PROCEDURES

The Lockout/Tagout (LOTO) standard applies, but is not limited to, activities that are performed on a machine, a piece of equipment, a process, or circuit. Primary, secondary, stored, and single-source energy sources require a lockout when performing servicing and/or maintenance activities. Primary energy sources are the main energy sources such as electricity, gas, fluids, etc., provided to machines, equipment, processes, and circuits. Shut down machinery with moving parts or process equipment in service before adjustments or repairs. Project LOTO procedures must comply with the GE Master LOTO Program (Appendix D).

If shutdown is not feasible, a risk assessment must be used. The risk assessment explores the safest conditions possible for individual work assignments. Risk assessment establishes safe practices and alternative methods to reduce the possibility of injury when normal LOTO procedures cannot be applied. A task hazard analysis (mitigation plan) and written procedures specific for the job must be completed and reviewed with the CM prior to start.

Never remove warning or danger tags or locks on any apparatus, valves, or switches unless you have been instructed to do so, and then only by the persons who attached them.

Contractors who are involved with equipment/systems and are potentially exposed must implement procedures that provide protection equal to or better than the GE LOTO program. LOTO programs for outside services or contractors must be reviewed by authorized CM personnel.

The contractor supervisor must be made aware of the overall LOTO procedure and informed of the equipment specific procedure by the CM.

Contractors must place their own locks and tags (one lock, one key, one person) and verify LOTO by try-out. As a best practice, the CM may perform the LOTO step-by-step process. The contractor will then be required to attach and secure their individual LOTO locks and red tags to the same energy-isolating devices that the CM has locked out and validate zero energy by try-out.

All contractor workers involved in a LOTO operation must have documentation of LOTO training. This documentation must be available for audit at the work site.

4.5 FIRE PREVENTION/HOT WORK PROCEDURES

Smoking will only be allowed in designated areas. The CM will review contractor requests for specified smoking areas. The Contractor will be responsible for providing fire extinguisher, sand pail, and overall housekeeping and maintenance of their smoking area.

Use only approved cleaning agents — never gasoline or flammable liquids. Gasoline and similar flammable liquids must be stored only in approved safety containers and in areas free of burning hazards. Keep all heat sources from flammable liquids, gases, or other combustible materials. Open fires are strictly prohibited.

Every hot work operation must have a properly trained and equipped fire watch with appropriate fire extinguishers for the specific hazard in the work area. The fire watch must remain in the work area for at least one hour after the hot work activity is completed. The fire watch or designee must continue monitoring for an additional three hours. When the four-hour monitoring is completed, the fire safety supervisor inspects the area once more.

To avoid accidental displacement, keep compressed gas cylinders standing and securely tied off, whether empty or full. Make sure valve protection caps are on when cylinders are not in use. The valve shall be closed on all empty cylinders.

When moving cylinders by crane or derrick, a cradle, boat, or suitable platform shall be used. Slings or hooks shall not be used.

When cylinders are not in use, they must be secured and capped. If cylinders are not used within a 24-hour period, they are considered to be in storage, and must be secured, capped, and separated. Separate oxygen and fuel gas cylinders by a minimum of 20 feet or a 5-foot high, ½-hour fire-rated barrier. In lieu of removing the cylinders for storage as noted above, a gas cylinder cart with an engineered steel fire barrier (where the steel barrier has been engineered specifically to meet a ½-hour fire resistance rating and to prevent a fire in one cylinder from spreading to the other cylinder on the cart, and the barrier is also depicted as meeting the standard's height requirement of at least 5 feet high) would be acceptable in order to comply with §1926.350(a)(10).

It will be necessary to perform hot work such as welding, cutting, and grinding at various times during the project. Before any hot work can be performed, certain precautions must be taken and conditions met to determine that hot work efforts can be performed safely. The following are required:

- An initial site survey must be made by the contractor to determine that the area is free of flammable and combustible materials.
- Good housekeeping practices must be maintained at all sites that require hot work.
- Adequate fire extinguishing equipment must be in place and readily accessible at all hot work locations, and employees must be properly trained in the use of such equipment.
- Contractor will request a hot work permit (Attachment D), to be issued by CM. The request must be made at least four hours before beginning work.
- A firewatch must be provided as necessary and remain in place for 60 minutes after completion of work when conditions warrant and are so specified on the hot work permit. The fire watch or designee must continue monitoring for an additional three hours. When the four-hour monitoring is completed, the fire safety supervisor inspects the area once more. The firewatch must be trained to use the required fire extinguisher and hose, and be familiar with the position's responsibilities.

4.6 CONFINED SPACE PROCEDURES

A confined space is an enclosed area that has each of the following four characteristics:

1. Large enough and so configured that a worker can bodily enter and perform assigned work;
2. Has limited means for worker entry and exit due to the number, size, or location of openings;
3. Is not designed for continuous worker occupancy; and
4. Contains or may contain a serious safety or health hazard.

Such hazards include currently or potentially hazardous atmospheres, potential worker entrapment (from inwardly converging walls or downward sloping floor), or potential worker engulfed by stored materials. Examples of confined spaces include tanks, vessels, pits, sewers, pipelines, boilers, and utility vaults.

It will be assumed that all confined spaces are Permit Required Confined Spaces (PRCSs) and will be entered as such, in accordance with the requirements of 29 CFR 1910.146, unless they can be shown and documented by a competent person to be a non-permit required confined space. Entry into a confined space shall be conducted only if necessary to do assigned work. Whenever possible, assigned work shall be completed from outside the space. The contractor shall implement procedures that provide protection equal to or better than the minimum requirements described in GE’s Confined Space Manual (Appendix E).

Entry into a confined space is prohibited until atmospheric testing of the space and applicable entry procedures have been documented and permits completed. See Attachment E for confined space entry permit.

All contractor entrants and attendants must have documentation of confined space entry/attendant training. Additional respiratory protection training and documentation will be required if respiratory protection is needed. This documentation must be available for audit at the work site.

All entrants and attendants must be informed of the entry procedures, permit requirements, air monitoring results, hazard mitigation plan and rescue plan prior to the entry. The use of appropriate retrieval equipment or other approved means of rescue is required for all confined space entries. The number of retrieval or rescue devices must be equal to number of entrants. An attendant shall be posted for the duration of entry and may not enter the confined space, leave their post nor be assigned any other duties that would distract them from their role as attendant.

4.7 FALL PROTECTION PROCEDURES

All workers in an area exposed to a fall greater than six feet must use appropriate fall protection. Such protection may include:

- Guardrail systems;
- Safety net systems; and
- Personal fall arrest systems.

Other protection methods include:

- Hole covers;
- Positioning device systems;
- Equipment guards;
- Fences and barricades; and
- Warning line systems set back a safe distance from the hazard, in combination with guardrail systems, safety net systems, personal fall arrest systems, or safety monitoring systems.

One hundred percent fall protection is required, but not limited to, the following when a worker is exposed to a fall of six feet or more:

- Working on barges with exposed hoppers or perimeters;
- Performing steel erection work;
- Working on scaffolds;
- Unprotected sides and edges;
- Overhand bricklaying and related work;
- Leading edges;

- Roofing work on low-slope roofs;
- Hoist areas;
- Steep roofs;
- Holes;
- Precast concrete erection;
- Formwork and reinforcing steel;
- Wall openings;
- Ramps, runways, and other walkways;
- Walking/working surfaces;
- Excavations;
- Aerial lifts;
- Dangerous equipment;
- Metal decking operations; and
- Erecting, dismantling, and working on scaffolds.

Trades people shall not stand on motors, pumps, conduits, mid or upper-rails of aerial or articulating lifts, or the like to gain access to elevated work. Use of a safety monitor system (SMS), controlled access zone (CAZ), or controlled decking zone (CDZ) will not be accepted unless prior approval from GE's Environmental, Health and Safety (EHS) program manager has been received.

Working on a roof within six feet of the edge or a floor opening requires appropriate fall protection (guardrail systems, safety net systems, or personal fall arrest systems). Use of a safety monitor system or controlled access zone will not be accepted without prior approval from GE's EHS program manager.

A full-body safety harness must be worn at all times in articulating scissors and personnel lifts. Chains must be closed. Harnesses must be secured to an approved tie-off point when breaking the plain of the lift. Safety harnesses must be secured to an approved tie-off point in all aerial lifts. Establish a barricaded or roped off danger zone around lifts for falling objects.

Hoisting of personnel on a personnel platform by a crane or derrick is prohibited, except when the erection, use, and dismantling of conventional means of reaching the worksite, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform, or scaffold, would be more hazardous or is not possible because of structural design or worksite conditions. This type of operation must meet the requirements of OSHA 1926.550(g).

Workers must wear a full-body safety harness with a safety lanyard secured to a separate lifeline while working from swing scaffolds, boatswain's chairs, or other suspended work platforms where a fall hazard is present.

Contractor must develop a written fall protection program and communicate it to all affected employees. The program will contain the following elements:

- Hazard identification;
- Selection of fall hazard control;
- Equipment inspection and maintenance;
- Rescue and retrieval methods for employees involved in a fall; and
- Employee training.

Contractor must conduct a fall hazard assessment to address both routine ongoing activities and tasks as well temporary activities, which may take place during maintenance and construction. Control measures will be identified, implemented, and communicated by the contractor. Documentation of fall hazard control measures should be included in JSAs, safe work plans, or other operating procedures.

Contractor workers must be trained in the requirements of the fall protection program, including use of fall protection equipment as appropriate. Contractors must inspect and maintain fall protection equipment in accordance with manufacturer's recommendations.

Barges or other marine equipment that are not fitted with guard rail systems shall meet applicable fall protection requirements.

4.8 CRANES, HOISTING, AND RIGGING

Never raise a load over people or occupied buildings. Tag lines must be used to control every load. Rigging operations utilizing chains are not permitted without prior approval from GE EHS program manager. Multiple-lift rigging is strictly prohibited. All materials shall be rigged to prevent unintentional displacement. Hooks with self-closing safety latches shall be used to prevent components from slipping out of the hook. Rigging must be in good condition, appropriate for the lift and tagged with a manufacturer's rating tag. Defective rigging equipment, or rigging without a manufacturer's rating tag shall be labeled "Do Not Use," and removed from service.

Only qualified operators may operate power equipment. Seat belts must be worn where applicable.

Safe lifting procedures for cranes and hoists must be developed and documented. Crane and hoist operators and qualified riggers must conduct documented rigging equipment inspections prior to each use on each shift and as necessary during its use to ensure that it is safe.

All operators of cranes and hoists should have received training that addresses safe operating practices for all crane types that they will be operating on site.

Preventative maintenance must be conducted on cranes and hoists in accordance with manufacturer's guidance or local regulatory requirements.

Contractors must submit copies of detailed and documented annual inspections conducted by qualified individuals.

Operators of tower cranes, derricks, and mobile cranes must possess a current Certificate of Competence. Operator certification and crane operations must comply with all applicable requirements of New York State Code Rule 23, Subpart 23-8.

Riding on hooks, headache balls, or slings of hoisting equipment is strictly prohibited.

4.9 SCAFFOLDING

All scaffolds must be inspected before use and must be designed for the safe working load. Only scaffold planking tested and approved to carry the load may be used. Scaffold planking must be secured by tying or cleats to prevent slipping. Mark scaffold planks (in most cases the manufacturer does this) and use only on scaffolds.

Handrails and toe boards shall be used on all scaffolds and the scaffold secured as required. Rolling tower scaffolds must be locked while the scaffold is in use. Tower must be free of personnel, material, and equipment before being moved. Rolling scaffolds are not to be moved from the top. Ladders must be used for accessing scaffolds. Climbing of bracing is prohibited.

Scaffold platforms 6 feet or more above any working surface must be equipped with a guardrail system. Top rails (42 inches plus or minus 3 inches), mid rails (midway between the top rail and the scaffold platform), and toe boards or personal fall arrest systems must be implemented.

No scaffold shall be erected, moved, dismantled, or altered except by trained and qualified personnel under the authority of the competent person. Personnel erecting or dismantling scaffolding must adhere to fall protection standards above 6 feet.

Abide by the scaffold tag system:

- *GREEN*–complete scaffold per required safety standards.
- *YELLOW*–conditional use — 100% fall protection required.
- *RED*–Scaffold not complete. Do Not Use.

Makeshift platforms, such as stacked materials, chairs, boxes, or drums shall not be used. Scaffolds shall be built to OSHA standards (1926.451).

Tubular welded frame scaffolds have additional special safety requirements: scaffold legs shall be set on adjustable bases, plain bases, or other foundations adequate to support the maximum rated load. To prevent movement, the scaffold shall be secured to the building or structure at intervals not to exceed 30 feet horizontally and 26 feet vertically. All pins to secure diagonal braces and to prevent uplift shall be used. Outriggers and platforms below the working/walking level shall be fully planked. Outriggers shall be tied to the frame. Scaffolds may not be used as material hoist towers or for mounting derricks without first determining the loads and stress involved. All scaffolds shall be free of tools, trash, etc. before calling in for removal.

4.10 ELECTRICAL SAFETY

Electrical equipment shall not be installed, repaired, or removed except by trained qualified electricians. Electrically operated equipment (stationary and portable) must be grounded.

When extension cords, power tools or equipment cords are frayed or worn, or when bare wire is showing, the equipment must be tagged and taken out of service. Do not use electrical tape on extension cords. Temporary cords should be supported a minimum of eight feet above the floor in egress walkways, corridors and areas requiring employee access. Temporary lighting must be guarded.

All 120-volt, single phase 15- and 20-ampere receptacle outlets at the Processing Facility, Work Support Marina, and all support sites, which are not a part of the permanent wiring of the building or structure and are in use by employees, shall have approved ground fault circuit interruption (GFCI) for personnel protection. When using the permanent receptacles, GFCI devices must be installed on each extension cord prior to the source receptacle.

Lock Out Tag Out (LOTO) programs represent a lifesaving control. Compliance with GE's procedures is mandatory. Equipment-specific energy control procedures are required for all LOTO operations.

Extension cords must be at least 16-gauge heavy duty three-wire with a UL approved three prong grounded plug. Extension cords connected in series shall not exceed 200 linear feet. 110-volt outlets on portable generators and welders shall be three-way (NEMA 5-15R) grounded to the frame. The power lead shall be connected through a GFCI. Prior to in-service each generator shall best tested to assure grounded connections.

Arc flash is a rapid, explosive discharge of electrical energy that usually results from a short circuit fault. Project equipment has been designed and incorporates arc flash calculations, arc flash hazard categories and arc rating labeling on the equipment. All work on the electrical equipment where arc flash is possible will be performed by a qualified electrician and will require the appropriate Arc Flash PPE as specified and detailed in NFPA70E.

4.11 HAND AND POWER TOOLS

All hand and power tools must be the appropriate tool for the job. They must be inspected prior to use.

Defective tools and equipment must be taken out of service and shall be properly repaired before reuse. Machinery, tools (including portable grinders and buffers) and equipment with exposed gears, belts, power transmission, couplings, etc., shall not be operated without effective guards in place.

The use of gasoline and propane-powered equipment in any building is strictly prohibited unless specific permission is granted by the CM.

Operators of powder actuated tools, i.e., tools that use a chemical propellant charge to propel nails or other such fasteners, must have documented safety training in the use of such tool.

4.12 LADDER SAFETY

All ladders shall be heavy duty, industrial strength fiberglass/composite construction. The use of metal/aluminum and wooden ladders is prohibited unless approved for a specific purpose in advance by the CM.

Stepladders must be fully opened and used as intended. They cannot be used as straight ladders. Tie-off all straight and extension ladders to keep them secure. Straight and extension ladders must extend at least three feet beyond the top landing. The base of the ladder shall be set out at least one-fourth of the ladder height measured from bottom to point of bearing.

Any ladder found defective shall be tagged, removed from service and either destroyed (vertically) or repaired to original specifications.

Do not place ladders in blind spots (doorways, driveways) or in egress ways unless properly barricaded or guarded.

4.13 HOUSEKEEPING

Cleanliness and orderliness are the first fundamentals of good housekeeping. Contractors are responsible for cleaning up and removing hazardous and non-hazardous waste generated on site. Each contractor shall be responsible for maintaining work areas free from waste materials, debris, and rubbish. Work will not be considered complete until all waste materials are removed and the work area returned to a clean and orderly condition. Waste material must be disposed of off-site.

All protruding nails in form lumber, boards, etc., must be withdrawn or bent into the wood before the wood is stacked or piled.

Rags, packing materials, paper cups, and sawdust in saw areas must be collected daily and placed in proper containers.

All objects with sharp edges (scrap sheet metal, scrap glass, bottles, metal cans) shall be collected daily and placed in containers.

Avoid placing debris and other obstacles in roadways, walkways, aisles, and other travel routes.

Allow sufficient time at the end of each day for proper cleanup of the work area. Place all debris in proper refuse containers.

All stored material must be kept in an orderly manner at all times.

Provide a proper collection container and floor protection when using cutting oil, solder flux, hydraulic oil, and other fluids. Rags containing oil, hydraulic fluid or other combustible fluids shall not be placed in trash containers with the other wastes, shall not be placed in containers left inside buildings and shall be disposed of in accordance with applicable hazardous waste regulations. In the event of a large spill, immediately install acceptable containment barriers.

4.14 STEEL ERECTION

The safety standards for structural steel erection will follow the OSHA regulations for Steel Erection Subpart R (1926.750-1926.761 inclusive of Appendices A-H) dated January 18, 2001, and revised on July 18, 2001, with the following exceptions and additions:

- All workers, including connectors and deckers, must be protected from falls at or greater than 6 feet (1.8m).
- Multiple lift rigging procedures (Christmas treeing) is strictly prohibited.
- The use of a CDZ is prohibited.

Cranes used in steel erection activities shall be visually inspected prior to each shift by a competent person. The inspection must include observation for deficiencies during operation. The inspection must be written and a copy submitted to the CM daily. Deficiencies constituting a hazard require that the hoisting equipment be removed from service until the deficiency is corrected.

At the end of the shift or when environmental or jobsite conditions require, metal decking must be secured against displacement. Metal decking must be laid tightly and immediately secured upon placement to prevent accidental movement or displacement.

Wire mesh, exterior plywood, or equivalent must be installed around columns where planks or metal decking do not fit tightly. The materials used must provide fall protection for personnel and prevent objects from falling through.

All columns must be anchored by a minimum of four anchor bolts. Anchor bolts should not be repaired, replaced, or field modified without the approval of the project structural engineer of record.

4.15 DIVING SAFETY

All diving operations conducted during the project are considered to be commercial diving operations; exceptions to this rule can only be granted after a written request to use scientific diving procedures has been reviewed and approved by the CM. However, without exception, any diving operations conducted by the Facility Site Work Construction Contractor, Processing Facility Operations Contractor, Dredging Contractor, and Habitat Construction Contractor or subcontractors are considered to be commercial diving operations, and not scientific diving.

Each contractor involved in commercial diving operations must comply with all applicable requirements of OSHA's Commercial Diving Standard (29 CFR 1910 Subpart T, presented in Appendix C). They must develop a *Safe Practices Manual* as per 29 CFR 1910.420(b) for their diving operations before beginning work. The Manual shall be made available at the dive location and each dive team member must read and be familiar with the Safe Practices Manual. This manual must include:

- A copy of the OSHA Commercial Diving Standard and the employer's policies for implementing the requirements of this standard;
- Safety procedures and checklists for diving operations;
- Assignments and responsibilities of the dive team members;
- Equipment procedures and checklists; and
- Emergency procedures.

4.15.1 General

General diving safety requirements are summarized below:

- Contractors engaged in commercial diving must develop and follow a Safe Practices Manual.
- All diving operations will be performed with a minimum of two divers dressed on site (one may be a standby diver on the surface). In the event that audio communication fails, line pull signals will be established and the dive terminated until radio communications can be restored.
- All diving will be from boats, an approved shoreline work location, or a dive platform.
- Diver tenders are to remain on duty at their stations until divers are out of the water.
- No night diving will occur.
- All diving will be conducted with SCUBA equipment or approved surface supplied air systems.
- No diving will be conducted at depths greater than 35 feet.
- No diving will be conducted in enclosed or physically confining spaces.
- No diving will be conducted against currents exceeding 1 knot unless line-tended.
- No diving will take place if surface visibility is less than 200 feet at that given location.
- The diver must terminate a SCUBA dive while there is still sufficient cylinder pressure remaining (generally, 500 pounds per square inch (psi)) to permit the diver to safely reach the surface, including required in-water decompression time, if applicable. For purposes of this project, in-water decompression is not likely due to the shallow depths at which work will be performed.
- All definable features of work (a definable feature of work is a task that is separate and distinct from other project activities and has separate control requirements.) that

involve diving require a task specific “Dive Plan” that addresses the task for the dive, location, safety procedures, unusual hazards or environmental conditions, equipment to be used, maximum depths and estimated bottom times. The plan shall address appropriate ranges of water velocity, visibility, temperature, etc. that diving operations for that definable feature of work may be conducted.

- Liveboating (the practice of supporting a surface-supplied air or mixed-gas diver from a vessel which is underway) shall not be performed.
- The contractor shall maintain and use a two-way voice communication system for all communications with divers.
- The contractor shall maintain a dive profile to include a written record for each diver with the depth-time profile to aid the designated person-in-charge in implementing the planned dive schedule and making necessary adjustments.
- The contractor shall terminate a dive when a diver makes a request, a diver fails to respond to communications or signals, or communications are lost and cannot be quickly re-established with the diver.
- Post-dive, the contractor shall check the physical condition of the diver; instruct the diver to report any physical problems or adverse physiological reactions; advise the diver of the nearest decompression chamber, and alert the diver to the hazards of flying too soon after the dive.
- The contractor shall comply with OSHA record keeping requirements to maintain a safe practices manual; depth-time profiles of each dive; the dive record; decompression-procedure assessment evaluations; equipment-inspection records, equipment-testing records, and hospitalizations records.
- The buddy system and diver attendants are to be used to monitor dive team members.
- Proper ascent techniques are to be established to reduce the potential for air embolisms.
- Work is only to be conducted when current flows are within established limits for the project, under 1.5 fps,

4.15.2 Training

Each dive team member shall meet the minimum qualifications outlined in 29 CFR 1910.410 and the Consensus Standards for Commercial Diving and Underwater Operations (ADCI 2004). Each diver will be assigned tasks in accordance with their experience and training. Each diver must be trained, qualified, and authorized for the diving mode and specialized equipment being used, the diving activity to be performed, and the depths at which the dive is to be conducted. Contractors shall maintain a file on each diver that identifies training, qualifications and what activities the diver can perform.

Tasks may be assigned to an individual who has not previously performed the specific task, provided that these tasks are performed under the direct supervision of an experienced dive team member.

All dive team members must be trained in CPR and first aid (American Red Cross standard course or equivalent). An AED will be available on the dive platform.

4.15.3 Dive Planning

Planning of each diving operation will include an assessment of the safety and health aspects of each task. Planning elements include:

- Diving mode;
- Safe entry procedures, considering underwater obstructions or shallow depths;
- Procedures and engineering controls to preclude contact with propellers;
- Surface and underwater conditions and hazards;
- Breathing gas supply (including reserves);
- Thermal protection;
- Diving equipment and systems;
- Dive team assignments and physical fitness of dive team members; and
- Emergency and rescue procedures.

The diving contractor will provide a task specific “Dive Plan” for each individual diving assignment. Each task specific Dive Plan should be reviewed and accepted by the CM before the diving operation can begin.

To minimize hazards to the dive team, diving operations shall be coordinated with other activities in the vicinity that could potentially interfere with the diving operation, including recreational activities as well as commercial activities.

4.15.4 Dive Site Preparation

Appropriate protocols such as dive flagging will be used to alert boaters where diving operations are underway. A warning horn and hailing device shall be available to communicate with other vessels, including small craft which might not be equipped with VHF radio communication. Diver communication systems shall be used to call “Diver up” when hailing other vessels does not work.

During the pre-dive briefing, all dive team members will receive a briefing by the Dive Supervisor on the following topics:

- Tasks to be undertaken;
- Safety procedures for the diving mode;
- Any unusual hazards or environmental conditions likely to affect the safety of the diving operation; and
- Any modifications to operating procedures necessitated by the specific diving operation.

Prior to making individual dive team member assignments, the Dive Supervisor must inquire into each dive team member's current state of physical fitness, and indicate to the dive team member the procedure for reporting physical problems or adverse physiological effects during and after the dive.

4.15.5 Equipment Inspection

The procedures listed below must be followed when conducting equipment inspection:

- Each diver must conduct a functional check of his/her diving equipment in the presence of the Dive Supervisor. Each diver must verify that his/her equipment is in proper working order, and that the equipment is suitable and sufficient for the type of diving operation planned. The Dive Supervisor must verify that the equipment check has been performed.
- Each diver must have a submersible pressure gauge for monitoring SCBA cylinder pressure, capable of being monitored by the diver during the dive.
- Each diver must have the capability of achieving and maintaining positive buoyancy on the surface.
- Each diver must have the capability to execute a controlled neutrally buoyant ascent through the use of an approved buoyancy control device.
- The entire SCUBA apparatus for each diver must be inspected by the diver and Dive Supervisor prior to the dive. Critical inspection points include the breathing gas supply system, masks, thermal protection, and weights.
- The proper function of the cylinder pressure gauge must be inspected by each scuba diver and verified by the Dive Supervisor.
- The pre-dive briefing and equipment inspection shall be documented.

4.15.6 Water Entry and Exit

The procedures listed below must be followed when entering and exiting the water:

- A means capable of supporting the diver will be provided for entering and exiting the water, unless the entry is in water of wading depth. The means provided for exiting the water must extend below the water surface.
- A means will be provided to assist an injured diver from the water.
- Safe entry procedures must consider underwater obstructions or shallow depths.

4.15.7 Emergency Procedures

The procedures listed below must be followed in the event of an emergency during underwater operations:

- A standby diver must be available any time a diver is in the water.

- Divers must be line-tended from the surface, or accompanied by another diver in the water in continuous visual contact during the diving operations.
- A diver-carried reserve breathing gas supply must be provided for each diver. The reserve must be either a manual reserve (J valve), or an independent reserve cylinder with a separate regulator or connected to the underwater breathing apparatus.
- The valve of the reserve breathing gas supply must be in the closed position prior to the dive.

4.16 SOFT/HARD LINES

Soft lines, e.g., synthetic rope, and hard lines, e.g. wire rope, shall be inspected as specified by the manufacturer, by a competent person, before use on each shift and as necessary during its use to ensure it is safe.

For hard lines, when two or more wires are broken or rust or corrosion is found adjacent to a socket or end fitting, or any other defect is found that would make the line unfit for service, the wire rope shall be removed from service or re-socketed.

High strength, lightweight soft lines (typically synthetic) shall be used in lieu of traditional heavy, low strength (typically natural materials) soft lines. Soft lines shall not be used if they are frozen or if they have been subjected to acids, corrosives, strong chemicals or excessive heat. Soft lines shall be protected from abrasion by padding where they are fastened or drawn over square corners, sharp edges, rough surfaces or other points of wear.

The use and maintenance of soft and hard lines shall be in accordance with recommendations of the manufacturer, and within the safe working load of the line. Lines, when not in use, shall be properly stored and maintained in a safe condition.

Safe handling procedures for soft and hard lines shall be developed by any contractor using lines to secure a marine vessel, e.g., barges, dredges, tug boat, etc. Contractor personnel shall receive documented training that will include, but is not limited to; hand protection, pinch points, properly securing lines to bollards and cleats, body and hand positioning when handling or releasing lines, lines under load or tension, line selection, inspection techniques, line life factors, line working loads, broken lines, and wire rope clip spacing and orientation.

4.17 ENVIRONMENTAL HAZARDS

4.17.1 Heat Stress

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, etc., as well as the physical and conditioning characteristics of the individual. Since heat stress is one of the most common illnesses associated with heavy outdoor work conducted with direct solar load and, in particular, because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses. Personnel must be aware of the types and causes of heat-related illnesses and be able to recognize the signs and symptoms of these illnesses in both themselves and their co-workers.

Hazards

Heat rashes are one of the most common problems in hot work environments. Commonly known as prickly heat, a heat rash is manifested as red papules and usually appears in areas where the clothing is restrictive. As sweating increases, these papules give rise to a prickling sensation. Prickly heat occurs in skin that is persistently wetted by unevaporated sweat, and heat rash papules may become infected if they are not treated. In most cases, heat rashes will disappear when the affected individual returns to a cool environment and cleans the skin surface.

Heat cramps are usually caused by performing hard physical labor in a hot environment. These cramps have been attributed to an electrolyte imbalance caused by sweating. It is important to understand that cramps can be caused both by too much or too little salt.

Cramps appear to be caused by the lack of water replenishment. Because sweat is a hypotonic solution (plus or minus 0.3% NaCl), excess salt can build up in the body if the water lost through sweating is not replaced. Thirst cannot be relied on as a guide to the need for water; instead, water must be taken every 15 to 20 minutes in hot environments.

Under extreme conditions, such as working for six to eight hours in heavy protective gear, a loss of sodium may occur. Drinking commercially available carbohydrate electrolyte replacement liquids can be effective in minimizing physiological disturbances during recovery. Their use should be evaluated by Contractor's SSO/SSHO.

Heat exhaustion occurs from increased stress on various body organs due to inadequate blood circulation, cardiovascular insufficiency, or dehydration. Signs and symptoms include pale, cool, and moist skin; heavy sweating; dizziness; nausea; headache; vertigo; weakness; thirst; and giddiness. Fortunately, this condition responds readily to prompt treatment.

Heat exhaustion should not be dismissed lightly, however, for several reasons. One is that the fainting associated with heat exhaustion can be dangerous because the victim may be operating machinery or controlling an operation that should not be left unattended; moreover, the victim may be injured when he or she faints. Also, the signs and symptoms seen in heat exhaustion are similar to those of heat stroke, which is a medical emergency.

Workers suffering from heat exhaustion should be removed from the hot environment, be given fluid replacement, and be encouraged to get adequate rest.

Heat stroke is the most serious form of heat stress. Heat stroke occurs when the body’s system of temperature regulation fails and the body’s temperature rises to critical levels. This condition is caused by a combination of highly variable factors, and its occurrence is difficult to predict.

Heat stroke is a medical emergency. The primary signs and symptoms of heat stroke are confusion; irrational behavior; loss of consciousness; convulsions; a lack of sweating (usually);

hot, dry skin; and an abnormally high body temperature, e.g., a rectal temperature of 105.8 degrees Fahrenheit (°F). If body temperature is too high, it causes death. The elevated metabolic temperatures caused by a combination of workload and environmental heat load, both of which contribute to heat stroke, are also highly variable and difficult to predict.

If a worker shows signs of possible heat stroke, professional medical treatment should be obtained immediately. The worker should be placed in a cool or shady area and the outer clothing should be removed. The worker's skin should be wetted and air movement around the worker should be increased to improve evaporative cooling until professional methods of cooling are initiated and the seriousness of the condition can be assessed. Fluids should be replaced as soon as possible. The medical outcome of an episode of heat stroke depends on the victim's physical fitness and the timing and effectiveness of first-aid treatment.

Regardless of the worker's protestations, no employee suspected of being ill from heat stroke should be sent home or left unattended unless a physician has specifically approved such an order.

Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or exhaustion, that person may be predisposed to additional heat injuries.

Control Measures

Heat stress monitoring and work rest cycle implementation should commence when the ambient adjusted temperature exceeds 72°F. A minimum work rest regimen and procedures for calculating ambient adjusted temperature are described in Table 1, below.

Table 1 – Work/Rest Schedule[a, b]

Adjusted Temperature[c]	Work-Rest Regimen Normal Work Ensembled[d]	Work-Rest Regimen Impermeable Ensemble
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5° to 90°F (30.8° to 32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5° to 87.5°F (28. 1° to 30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5° to 82.5°F (25.3° to 28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5° to 77.5°F (30.8° to 32.2°C)	After each 150 minutes of work	After each 120 minutes of work

Notes:

a. For work levels of 250 kilocalories/hour (light-moderate type of work)

b. The information presented above was generated using the information provided Table 8-10 of the *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, National Institute for Occupational Safety and Health (NIOSH), OSHA, USCG, and USEPA (86-116, October 1985).

c. Calculate the adjusted air temperature (ta adj) by using this equation: ta adj ºF = ta ºF + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100% sunshine = no cloud cover and a sharp, distinct shadow; 0% sunshine = no shadows.)

d. A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

To determine if the work rest cycles are adequate for the personnel and specific site conditions, additional monitoring of individual heart rates will be conducted during the rest cycle. To check the heart rate, count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period by one third and maintain the same rest period.

Additionally, one or more of the following control measures can be used to help control heat stress and are mandatory if any site worker has a heart rate (measure immediately prior to rest period) exceeding 115 beats per minute:

- Site workers will be encouraged to drink plenty of water and/or electrolyte replacement fluids throughout the day. Their use should be evaluated by Contractor's SSO/SSHO.
- On-site drinking water will be kept cool (50°F to 60°F).
- A work regimen that will provide adequate rest periods for cooling down will be established, as required.
- All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps.
- Cooling devices, such as vortex tubes or cooling vests, should be used when personnel must wear impermeable clothing in conditions of extreme heat.
- Site personnel should be instructed to monitor themselves and co-workers for signs of heat stress and to take additional breaks as necessary.
- A shaded rest area must be provided. All breaks should take place in the shaded rest area.
- Site personnel must not be assigned to other tasks during breaks.
- Site personnel must remove impermeable garments during rest periods. This includes white Tyvek®-type garments. Frequent changes of the garments are recommended.

All project personnel must be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress disorders.

4.17.2 Cold Stress

Cold stress normally occurs in temperatures at or below freezing, or under certain circumstances, in temperatures of 40°F.

Hazards

Extreme cold for a short time may cause severe injury to exposed body surfaces or result in profound generalized cooling, causing death. Areas of the body that have high surface area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible. Two factors influence the development of a cold weather injury: ambient temperature and the velocity of the wind. For instance, 10°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18°F. An equivalent chill temperature chart relating the actual dry bulb temperature and wind velocity is presented in Table 2, below.

Table 2 – Wind Chill Temperature Chart

Estimated Wind Speed (in mph)	Actual Temperature Reading (ºF)											
	50	**40**	**30**	**20**	**10**	**0**	**-10**	**-20**	**-30**	**-40**	**-50**	**-60**
	Equivalent Chill Temperature (ºF)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds.				
	Trench foot and immersion foot may occur at any point on this chart.											

Note: This chart was developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA (Source: ACGIH Threshold Limit Values for Chemical Substances and Physical Agents).

Frostbite is the generic term for a local injury resulting from cold. Several degrees of tissue damage are associated with frostbite. Frostbite of the extremities can be categorized into:

- Frost Nip or Incipient Frostbite — characterized by sudden blanching or whitening of skin;
- Superficial Frostbite — skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient; or
- Deep Frostbite — tissues are cold, pale, and solid; extremely serious injury.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. It can be fatal. Its symptoms are usually exhibited in five stages:

1. Shivering;
2. Apathy, listlessness, sleepiness, and (sometimes) rapid cooling of the body to less than 95°F;
3. Unconsciousness, glassy stare, slow pulse, and slow respiratory rate;
4. Freezing of the extremities; and
5. Death.

Trauma sustained in freezing or sub-zero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues in addition to providing for first-aid treatment. To avoid cold stress, site personnel must wear protective clothing appropriate for the level of cold and physical activity. In addition to protective clothing, preventive safe work practices, additional training, and warming regimens may be utilized to prevent cold stress.

Control Measures

To prevent cold stress illnesses, follow the safety precautions listed below.

- Protective gloves are typically worn during field activities. These gloves offer some thermal protection. For air temperature of 0°F or less, mittens should be used to protect the hands. For exposed skin, continuous exposure should not be permitted when air speed and temperature results in a wind chill temperature of -25°F.
- At air temperatures of 36°F or less, field personnel who become immersed in water or whose clothing becomes wet must be immediately provided with a change of clothing and be treated for hypothermia.
- If work is done at normal temperature or in a hot environment before entering the cold, the field personnel must verify that their clothing is not wet due to perspiration. If wet, field personnel must change into dry clothes prior to entering the cold area.
- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work must be modified or suspended until adequate clothing is made available or until weather conditions improve.
- Field personnel handling evaporative liquid, e.g., gasoline, alcohol, or cleaning fluids, at air temperatures below 40°F must take special precaution to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling.

In addition, the following safe work practices should be employed to prevent cold stress:

- All field personnel will be provided with adequate cold weather gear, including insulated coveralls, gloves or mittens, and cold weather boots. Warming facilities or equipment will be provided, e.g., heated car, and utilized by field personnel as needed. When the water temperature is between 40 and 50 degrees Fahrenheit, field personnel working on the river or canal shall wear a float coat (top half of a Mustang Suit) or a one-piece survival suit. When the water temperature is less than 40 degrees Fahrenheit, field personnel shall wear either a float coat and bib-overalls (a full two-piece Mustang Suit), or a one-piece survival suit. Suits or Float Coats shall be USCG-approved. If extremely cold or severe weather conditions are forecast, work activities should be postponed.

- Direct contact between bare skin and cold surfaces (less than 20°F) should be avoided. Metal tool handles and/or equipment controls should be covered by thermal insulating material.
- For work performed in a wind chill temperature at or below 10°F, workers should be under constant protective observation (buddy system). The work rate should be established to prevent heavy sweating that will result in wet clothing. For heavy work, rest periods must be taken in heated shelters and workers should be provided with an opportunity to change into dry clothing if needed.
- Field personnel should be provided the opportunity to become accustomed to cold-weather working conditions and required protective clothing.
- Work should be arranged in such a way that sitting or standing still for long periods is minimized.
- During the warming regimen (rest period), field personnel should be encouraged to remove outer clothing to permit sweat evaporation or to change into dry work clothing. Dehydration, or loss of body fluids, occurs insidiously in the cold environment and may increase susceptibility to cold injury due to a significant change in blood flow to the extremities. Fluid replacement with warm, sweet drinks and soups is recommended. The intake of coffee should be limited because of diuretic and circulatory effects.

4.17.3 Biological Hazards

Portions of the field work will be conducted in grassy and wooded areas along the river. Numerous biological hazards may be present, including poison ivy, snakes, thorny bushes and trees, ticks, mosquitoes, and other pests.

4.17.3.1 Tick-Borne Disease

The following tick-borne diseases may present hazards when conducting field work. These diseases are transmitted primarily by the deer tick, which is smaller and redder than the common wood tick. The disease may be transmitted by immature ticks, which are small and hard to see. The tick may be as small as a period on this page.

- *Lyme Disease* — The disease commonly occurs in New York State in the spring and summer and is transmitted by the bite of infected ticks. Symptoms of Lyme disease include a rash or a peculiar red spot, like a bull's eye, which expands outward in a circular manner. The victim may have headache, weakness, fever, a stiff neck, swelling and pain in the joints, and eventually, arthritis.
- *Erlichiosis* — The disease also commonly occurs in New York State in the summer and is transmitted by the bite of infected ticks. Symptoms of erlichiosis include muscle aches, joint aches, and flu-like symptoms, but there is typically no skin rash.

- *Rocky Mountain Spotted Fever (RMSF)* — This disease is transmitted via the bite of an infected tick. The tick must be attached four to six hours before the disease-causing organism (*Rickettsia rickettsii*) becomes reactivated and can infect humans. The primary symptom of RMSF is the sudden appearance of a moderate-to-high fever. The fever may persist for two to three weeks. The victim may also have a headache, deep muscle pain, and chills. A rash appears on the hands and feet on about the third day and eventually spreads to all parts of the body. For this reason, RMSF may be confused with measles or meningitis. The disease may cause death, if untreated, but if identified and treated promptly, death is uncommon.

Control Measures

Tick repellant containing diethyltoluamide (DEET) should be used when working in tick-infested areas, and pant legs should be tucked into boots. In addition, workers should search the entire body every three or four hours for attached ticks. Ticks should be removed promptly and carefully without crushing, since crushing can squeeze the disease-causing organism into the skin. A gentle and steady pulling action should be used to avoid leaving the head or mouth parts in the skin. Hands should be protected with surgical gloves when removing ticks.

4.17.3.2 Poisonous Plants

Hazards

Poisonous plants may be present all along the river. Personnel should be alerted to their presence, and instructed on methods to prevent exposure.

Control Measures

The main control is to avoid contact with the plant, cover arms and hands, and frequently wash potentially exposed skin. Particular attention must be given to avoiding skin contact with objects or protective clothing that have touched the plants. Treat every surface that may have touched the plant as contaminated, and practice contamination avoidance. If skin contact is made, the area should be washed immediately with soap and water, and observed for signs of reddening.

4.17.3.3 Snakes

The possibility of encountering snakes exists, specifically for personnel working in grassy, wooded, and vegetated areas.

Hazards

Snake venoms are complex and include proteins, some of which have enzymatic activity. The effects produced by venoms include neurotoxic effects with sensory, motor, cardiac, and respiratory difficulties; cytotoxic effects on red blood cells, blood vessels, heart muscle, kidneys, and lungs; defects in coagulation; and effects from local release of substances by enzymatic actions. Other noticeable effects of venomous snake bites include swelling, edema, and pain around the bite, and the development of ecchymosis (the escape of blood into tissues from ruptured blood vessels).

Control Measures

To minimize the threat of snake bites, all personnel walking through vegetated areas must be aware of the potential for encountering snakes and the need to avoid actions potentiating encounters, such as turning over logs, etc. If a snake bite occurs, an attempt should be made to safely kill the snake for identification. The victim must be transported to the nearest hospital within 30 minutes; first aid consists of applying a constriction band and washing the area around the wound to remove any unabsorbed venom.

4.17.3.4 Spiders

Personnel may encounter spiders during work activities along the river.

Hazards

Two spiders are of concern, the black widow and the brown recluse. Both prefer dark sheltered areas such as basements, equipment sheds and enclosures, and around woodpiles or other scattered debris. The black widow is shiny black, approximately one inch long, and found throughout the United States. There is a distinctive red hourglass marking on the underside of the black widow's body. The bite of a black widow is seldom fatal to healthy adults, but effects include respiratory distress, nausea, vomiting, and muscle spasms. The brown recluse is smaller than the black widow and gets its name from its brown coloring and behavior. The brown recluse is more prevalent in the southern United States but may be found in New York State. The brown recluse has a distinctive violin shape on the top of its body. The bite of the brown recluse is painful and the bite site ulcerates and takes many weeks to heal completely.

Control Measures

To minimize the threat of spider bites, all personnel walking through vegetated areas must be aware of the potential for encountering these arachnids. Personnel need to avoid actions that may result in encounters, such as turning over logs and placing hands in dark places such as behind equipment or in corners of equipment sheds or enclosures. If a spider bite occurs, the victim must be transported to the nearest hospital as soon as possible; first aid consists of applying ice packs and washing the area around the wound to remove any unabsorbed venom.

4.17.3.5 Mosquitoes

Personnel may be exposed to mosquitoes during work activities along the river.

Hazards

Typical exposure to mosquitoes does not present a significant hazard. However, if West Nile virus is prevalent in the area, mosquitoes can present a hazard and exposure to this virus is increased. West Nile virus results in flu-like symptoms and can be serious if not treated or in immune-compromised individuals. West Nile cases have been confirmed in New York State.

Control Measures

To minimize the threat of mosquito bites, all personnel working outside must be aware of the potential for encountering mosquitoes and implement the basic precautions listed below:

- Avoid working at dawn or dusk when mosquitoes are most active.
- Prevent accumulation of standing water at the work site.
- Apply an insect repellent that contains DEET to exposed skin and clothing.
- Wear light colored clothes, preferably with long-sleeves and full-length pants.
- Do not touch any dead birds or animals.

If dead birds are detected near a particular work area, report to the local county health department. If flu-like symptoms are present, contact the site SSR for more information.

4.17.3.6 Wasps and Bees

The possibility of encountering wasps or bees may occur along the river, conducting field operations, or at the processing facility.

Hazards

Typical exposure to wasp or bees does not present a significant hazard. However, wasp or bee stings are very painful and can be very serious when individuals with an allergy are stung. Employees that have an allergy and have a prescribed Epinephrine Auto Injector (EpiPen) should let coworkers know where it is in the event they are stung. Personnel will only assist in administering the EpiPen if you are trained to do so or given permission by the injured person.

Control Measures

To prevent wasp and bee stings there are several steps to take:

- Look around the work area to see if there are any large groups of wasps or bees.
- Avoid wearing perfumes or colognes as they attract wasp or bees. Use an unscented sun block and insect repellant.
- If you see a wasp or bee, do not run away or make sudden moves.
- Do not kill a bee unless it is absolutely necessary. Bees emit an odor when they are killed that tells other bees there is danger. When other bees smell it, they attack and sting in large groups.
- If you see a large group of wasp or bees, leave them alone and leave the area. Report the location so proper removal of the wasps or bees can be accomplished.
- Apply an insect repellent that contains DEET to exposed skin and clothing.
- Wear light colored clothes, long sleeves and long-legged pants. Bees are attracted to sweaty skin.

- Avoid disturbing likely wasp nests and beehive sites, such as large trees, tree stumps, logs, and large rocks.

If you are stung by a wasp, bee, hornet or yellow jacket, follow these instructions:

- Bees leave behind a stinger attached to a venom sac. Do not try to pull it out as this may release more venom; instead gently scrape it out with a blunt-edged object, such as a credit card or dull knife.
- Wash the area carefully with soap and water. This should be continued several times a day until the skin is healed.
- Apply a cold or ice pack, wrapped in cloth for a few minutes.
- Apply a paste of baking soda and water and leave it on for 15 to 20 minutes.
- Telephone 911 to summon paramedics if the victim is having an allergic reaction, and use a bee sting emergency survival kit if previously prescribed.
- Treat swelling by elevating the swollen body part above the heat.
- Do not squeeze the sting, or rub mud into it. This increases the risk of infection.
- Do not administer drugs not prescribed for the victim. Seek immediate medical attention if you are stung in the mouth or nose, swelling may block airways. Also seek emergency care if any of the following symptoms are present, as these could indicate an allergic reaction: 1) large areas of swelling; 2) abnormal breathing; 3) tightness in throat or chest; 4) dizziness; 5) hives; 6) fainting; 70 nausea or vomiting; and 8) persistent pain or swelling.

4.18 LIFTING SAFETY

Using proper lifting techniques may prevent back strain or injury. The fundamentals of proper lifting include:

- Consider the size, shape, and weight of the object to be lifted. A mechanical lifting device or additional persons must be used to lift an object if it cannot be lifted safely alone.
- The hands and the object should be free of dirt or grease that could prevent a firm grip.
- Gloves must be used, and the object inspected for metal slivers, jagged edges, burrs, or rough or slippery surfaces.
- Fingers must be kept away from points that could crush or pinch them, especially when putting an object down.
- Feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear.
- The load should be kept as low as possible, close to the body with the knees bent.

- To lift the load, grip firmly and lift with the legs, keeping the back as straight as possible.
- A worker should not carry a load that he or she cannot see around or over.
- When putting an object down, the stance and position are identical to that for lifting; the legs are bent at the knees, and the back is straight as the object is lowered.
- When two persons are going to conduct a team lift, communication is key in coordinating the previously-listed lifting steps. One person should coordinate the lift.

4.19 POLYCHLORINATED BIPHENYLS (PCBs)

The chemical hazards associated with project operations are primarily related to ingestion of, and dermal contact with, PCBs (as well as any other potential constituents of concern (COC) that may be identified) in soils, sediments, and water. To minimize the potential for ingestion and dermal contact, appropriate personal hygiene must be followed during field activities. Inhalation exposure to PCBs is possible if project personnel inhale soil particles that contain PCBs or other constituents.

The OSHA permissible exposure limit (PEL) is a time-weighted average (TWA) airborne concentration of 1,000 micrograms per cubic meter (µg/m3) for PCBs containing 42% chlorine (average molecular formula of $C_{12}H_7C_{l3}$). The standard encompasses all physical forms of these compounds: aerosols, vapor, mist, sprays, and PCB-laden dust particles. The standard is based on an eight-hour work day, five days per week, with no weekend exposure. Contractors working more than a 40-hour work week are required to adjust the exposure level to match actual exposure hours.

Additionally, community exposure limits have been established in the Quality of Life Performance Standards (QoLPS). Work activities such as sediment handling and processing may result in PCB-related impacts to air quality of the general public. The QoLPS for air quality include standards and “concern levels” (at 80% of the standard levels) for total PCB concentrations in air during the remedial action. There are separate concern levels and standards for residential and commercial/industrial areas. They are:

- For residential areas, a concern level of 0.08 $\mu g/m^3$ and a standard of 0.11 $\mu g/m^3$, both as 24-hour average PCB concentrations; and
- For commercial/industrial areas, a concern level of 0.21 $\mu g/m^3$ and a standard of 0.26 $\mu g/m^3$, both as 24-hour average PCB concentrations.

4.20 DRILLING OPERATIONS

Drilling operations may be conducted on land using truck mounted equipment or on water using barge-mounted equipment. Drilling operations may consist of rotary, percussion, direct push, or vibratory methods.

Hazards

Tools and equipment, such as elevators, cat lines, and wire rope, have the potential for striking, pinning, or cutting personnel. The presence of overhead utilities and underground obstacles poses a hazard if boring equipment contacts them. For water based work, additional hazards are present related to unsecured equipment on the barge platform and the increased potential for man-overboard or drowning incidents.

- *Wire Rope* - Worn or frayed wire rope presents a laceration hazard if loose wires protrude from the main bundle.
- *Cat Lines* - Cat lines are used on drilling rigs to hoist material. Accidents that occur during cat line operations may injure the employee doing the rigging, as well as injure the operator. Insufficient hoisting control causes sudden and erratic load movements, which may result in hand and foot injuries.
- *Working Surfaces* - Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, slips, and falls.
- *Materials Handling* - The most common type of accident that occurs in material handling operations is the "caught between" situation when a load is being handled and a finger or toe gets caught between two objects. Rolling stock can shift and/or fall from a pipe rack or truck bed.

Control Measures

All drillers must possess required state or local licenses to perform such work and receive site-specific training prior to beginning work. The operator is responsible for the safe operation of drilling equipment and adherence to the requirements of the RA HASP. The driller must verify that all safety equipment is in proper condition and is properly used. The members of the drill crew must follow all instructions of the driller, wear appropriate PPE, and be aware of all hazards and control procedures. The drill crew must participate in the daily safety meetings and be aware of all emergency procedures.

Under no circumstances will personnel be permitted to ride the traveling block or elevators, nor will the cat line be used as a personnel carrier.

- *Pre-Drilling Protocol* - Before drilling activities commence, the existence and location of underground pipe, electrical equipment, and gas lines must be determined. An underground facilities protection organization (UFPO) must be contacted at least one week, but no more than two weeks, prior to subsurface activities. Arrange for telephone, electrical, cable television, and natural gas locators to mark out lines on site prior to conducting work. Provide the electric and natural gas locators with a site figure that shows the locations where drilling activities will be completed. Conduct a site walk with the locators to visually identify each location where drilling activities are to be completed. The Pre-Drilling/Subsurface Checklist for Intrusive Fieldwork (see Attachment G) must be used to document that nearby utilities have been marked on the ground, and that the drilling locations have been cleared. The completed Pre-Drilling/Subsurface Checklist for Intrusive Fieldwork must be present prior to commencement of any intrusive investigation.

- *Equipment Inspection* - Each day, prior to the start of work, the drill rig and associated equipment must be inspected by the driller and/or drill crew. The following items must be inspected:
  - Vehicle or derrick condition;
  - Proper storage of equipment;
  - Condition of all wire rope and hydraulic lines;
  - Fire extinguisher; and
  - First-aid kit.
- *Drill Rig Set Up* – For land-based operations, all boring sites will be inspected by the driller prior to mobilizing the rig to verify a stable surface exists. This is especially important in areas where soft, unstable terrain is common. The drill rig must be properly blocked and leveled prior to raising the derrick. The leveling jacks must not be raised until the derrick is lowered. The rig must be moved only after the derrick has been lowered. When the ground surface is soft or otherwise unstable, wooden blocks, at least 24 inches by 24 inches and 4 inches to 8 inches thick, must be placed between the jack swivels and the ground. The emergency brake must be engaged, and the wheels that are on the ground must be chocked. For river-based operations, the drill rig must be properly secured to the barge.
- *Overhead Electrical Clearances* - If drilling activities are conducted in the vicinity of overhead power lines, the power to the lines must be de-energized, tested de-energized, or marked up/guaranteed, or the equipment must be positioned such that no part, including derrick can come within the minimum clearances as outlined in the table below:

Minimum Clearances

Nominal System Voltage	Minimum Required Clearance
0-50kV	10 feet
51-100kV	12 feet
101-200kV	15 feet
201-300kV	20 feet
301-500kV	25 feet
501-750kV	35 feet
751-1,000kV	45 feet

When the drill rig is in transit, with the derrick lowered and no load, the equipment clearance must be at least 4 feet for voltages less than 50kV, 10 feet for voltages of 50kV to 345kV, and 16 feet for voltages above 345kV.

- *Hoisting Operations* - Drillers should never engage the rotary clutch without watching the rotary table, and confirming that it is clear of personnel and equipment. Other safety procedures concerning hoisting operations include:
  - Unless the draw works is equipped with an automatic feed control, the brake should not be left unattended without first being tied down.
  - Auger strings or casing should be picked up slowly.
  - During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller should be on the rig floor; no one else should be on the rig or derrick.
  - The brakes on the draw works of the drill rig should be tested by the driller each day. The brakes should be thoroughly inspected by a competent individual each week.
  - A hoisting line with a load imposed should not be permitted to be in direct contact with any derrick member or stationary equipment, unless it has been specifically designed for line contact.
  - Workers should never stand near the borehole whenever any wire line device is being run.
  - Hoisting control stations should be kept clean and controls labeled as to their functions.
- *Cat Line Operations* - Only experienced workers will be allowed to operate the cathead controls. The kill switch must be clearly labeled and operational prior to operation of the cat line. The cathead area must be kept free of obstructions and entanglements.

The operator should not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted.

Personnel should not stand near, step over, or go under a cable or cat line that is under tension.

- Employees or subcontractors rigging loads on cat lines must:
  - Keep out from under the load;
  - Keep fingers and feet where they will not be crushed;
  - Be sure to signal clearly when the load is being picked up;
  - Use standard visual signals only and not depend on shouting to co-workers for communication; and

- Make sure the load is properly rigged, since a sudden jerk in the cat line will shift or drop the load.

- *Wire Rope* - When two wires are broken or rust or corrosion is found adjacent to a socket or end fitting, the wire rope must be removed from service or resocketed. Special attention must be given to the inspection of end fittings on boom support, pendants, and guy ropes. Other safety procedures when using wire rope include:
  - Wire rope removed from service due to defects must be cut up or plainly marked as being unfit for further use as rigging.
  - Wire rope clips attached with U-bolts must have the U-bolts on the dead or short end of the rope, i.e. "never saddle a dead horse"; the clip nuts must be re-tightened immediately after initial load carrying use and at frequent intervals thereafter.
  - When a wedge socket fastening is used, the dead or short end of the wire rope must have a clip attached to it or looped back and secured to it by a clip; the clip must not be attached directly to the live end.
  - Protruding ends of strands in splices on slings and bridles must be covered or blunted.
  - Except for eye splices in the ends of wires and for endless wire rope slings, wire rope used in hoisting, lowering, or pulling loads, must consist of one continuous piece without knot or splice.
  - An eye splice made in any wire rope must have not less than five full tucks.
  - Wire rope must not be secured by knots. Wire rope clips must not be used to splice rope.
  - Eyes in wire rope bridles, slings, or bull wires must not be formed by wire clips or knots.

- *Auger Handling* - Auger sections must be transported by cart or carried by two persons. Individuals should not carry auger sections without assistance. Other safety precautions when handling augers include:
  - Workers should not be permitted on top of the load during loading, unloading, or transferring of rolling stock.
  - When equipment is being hoisted, personnel should not stand where the bottom end of the equipment could whip and strike them.
  - Augers stored in racks, on catwalks, or on flatbed trucks or barges should be secured to prevent rolling.

4.21 ELECTROFISHING

The use of electrofishing equipment involves potential hazards related to the high voltage output. Because water is an excellent conductor of electricity, the operator of the electrofishing equipment must observe certain precautions to avoid injury.

The electrofisher operates by sending current through the cathode, through the water, and to the anode. The equipment operator must become part of the circuit to be shocked. Touching the cathode and anode simultaneously would complete the circuit and result in a severe electric shock. Operators are not permitted to touch the electrodes.

Symptoms of electric shock range from muscle contraction (unable to let go), potential lung paralysis, ventricular fibrillation, heart paralysis, severe burns, and death.

Control Measures

The following general safety procedures apply to all types of electrofishers, and should be observed at all times.

- Use electrical lineman gloves of at least 1,000-volt rating. If the gloves become very wet inside, stop electrofishing and dry them thoroughly or use a dry pair of gloves.
- Remove wristwatch, rings, and any other metal jewelry.
- Use only dip nets with insulated or non-conductive handles.
- Make all electrical connections before turning on the power.
- Be sure that all personnel are aware that electrofishing is going to begin and that they are clear of electrodes before turning on the power.
- Be sure that no animals, e.g., livestock, dogs, etc., are in the water near the sampling locations.
- The equipment must include a switch that keeps the circuit open unless actively and continuously closed. The operator also will have access to an emergency shut-off switch.
- Operate the equipment within acceptable power ranges to prevent overloading the equipment and minimize the potential of fire hazard.
- During electrofishing, the high voltage flashing light and/or audible tone generator shall be working.
- Do not touch people, equipment, or metal objects with the anode or cathode probes/surfaces.
- Wear polarized sunglasses to detect sub-surface hazards and obstacles. No glasses with metallic frames are to be worn when electrofishing.
- Turn the power off immediately if a problem occurs and also when the unit is not in use.

Additional Control Measures for Backpack Electrofishers

The following safety procedures, including the previously listed general procedures, should be followed at all times when using backpack electrofishers.

- Use water-tight wading hip boots or chest waders. If the waders or boots become wet inside, stop electrofishing and dry them thoroughly or use a dry pair of boots or waders.
- Walk slowly and carefully to prevent tripping on objects in the stream.
- Sampling must cease if persons, pets, or livestock are observed in the water or on shore within 12 meters of the electrofishing unit.
- To prevent overloading the unit, do not touch the cathode with the anode.
- Check that the mercury tilt switch shuts off the power when the unit is tipped more than 45° from vertical.
- Backpack electrofishers add a burden to the user, requiring careful body positioning to avoid back strain.

4.22 WORKING ON A BRIDGE

Whenever possible, sampling will be performed from a boat. If sampling from a bridge is required, roadway traffic avoidance will be accomplished by following these procedures:

- A functioning cellular phone must be present at the site at all times for emergency communication.
- Check with the local traffic control department (police/public works) to determine if a stationed uniformed police office is necessary;
- If possible, schedule work for off-peak traffic hours;
- Personnel must utilize PPE, including an orange traffic safety vest, safety cones, and “men working” signs; personnel are to be trained to comply with DOT regulations.
- If a sidewalk is not present, then personnel must park the vehicle on the shoulder of the road with the emergency flashers on; the shoulder must be at least 6 feet wide and the wheels of the vehicle must not extend over the white lines on the roadway. Additionally, all personnel must conduct work on the opposite side of the vehicle from oncoming traffic, i.e., personnel are protected by the vehicle; and
- Work will only be conducted during daylight at bridge locations without sidewalks, and will not be conducted if slippery road conditions exist or if snow plows could potentially be in operation.

River traffic avoidance will be accomplished by following these procedures:

- During the navigation season, an easily visible floating buoy (i.e. orange) will be attached to the cable used to suspend all equipment from the bridge. This buoy will be attached using a sliding harness, allowing the buoy to float at the surface while the sampler is submerged.
- Prior to lowering any equipment, a visual observation will be performed to confirm the lack of boat traffic in the vicinity of the bridge.

Water safety and fall protection will be accomplished by following these procedures:

- All personnel must wear a USCG-approved PFD whenever working on or near the water, except when adequate fall protection exists on bridges (42" high top rail and mid-rail).
- Work must be conducted so that both feet of the personnel are on the base of the bridge, shoulder of the road, or sidewalk, e.g., not standing on the railing, with the center of gravity lower than the bridge railing. Additionally, a personal fall arrest system must be used if there is no guardrail at least 42 inches high.

4.23 IONIZING RADIATION

The Sediment Processing Facility utilizes four in-line density meters on process piping that contain an enclosed source of ionizing radiation. Personnel may work in the vicinity of the devices.

Hazards

The Ohmart-Vega density meters contain a Cesium-137 source. These meters detect the flow of liquid through pipes. The model is Gen 2000 density meter. The Cesium and a detector are placed on opposite sides of the material to be measured. Gamma or beta radiation is transmitted through the sample is then detected by the meter. The Cs-137 can be dangerous but the meters are designed to remain sealed and keep people from being exposed. This unit is set to have a 2mrem exposure maximum.

Control Measures

To eliminate the threat exposure from ionizing radiation all personnel must be aware of the control methods listed below:

- Workers performing tasks near the meters will be advised of their location.
- Observe the warning sign on the meters.
- Do not tamper with the meter housing or the locked enclosure.
- Report any concerns of meter or enclosure damage.

4.24 FATIGUE

The Sediment Processing Facility and Dredging Operations with extended work shifts, unusual hours of work and lack of sleep will contribute to fatigue. Fatigue increases the likelihood of inattentiveness and stress, which can lead to accidents.

Fatigue is defined as the reduced mental and physical functioning caused by sleep deprivation and/or being awake during normal sleep hours.

Control Measures

To eliminate fatigue, a Fatigue Risk Management Plan (FRMP) is to be developed to mitigate worker fatigue using the control methods listed below;

- A FRMP shall address how during full scale operations of 24 hours a day, six and potentially seven days a week, a work schedule can be structured to provide the required rest.
- Documentation shall be maintained to show compliance with the FRMP.
- The FRMP shall at a minimum contain the following:
  - A mandatory requirement for consecutive days off for every twelve consecutive days worked.
  - A maximum number of hours scheduled for work during any single shift.
  - A maximum number of hours worked total per day or extended shift.
  - A minimum of number of hours off between shifts.
  - A defined call-out system to cover for employee unscheduled time off.

SECTION 5

PERSONAL PROTECTIVE EQUIPMENT

5.1 LEVELS OF PROTECTION

PPE is required to safeguard project personnel from various hazards. Varying levels of protection may be required depending on the degree of physical hazard and the potential for exposure to PCB contaminated sediment.

PPE shall be worn at all times on the site, including travel within the site when starting or ending shifts.

- Hard hats are required at all times in the work area areas, i.e., construction, processing/operations, dredging, wharf, marine vessel. The following color code system for hard hats shall be implemented: White hard hats shall be worn by all GE, CM, Engineer of Record, and contractor personnel. Yellow hard hats shall be worn by all visitors. Red hard hats shall be worn by any personnel (except safety) with CPR/first aid certification. Green hard hats shall be worn by all safety personnel. Blue hard hats shall be worn by any new employee for the first 30 days. Cowboy hard hats are not permitted. Hard hats must be worn in the forward direction, unless the hard hat has a swivel suspension and is American National Standards Institute (ANSI) approved to be worn in the reverse direction.
- Appropriate eye and face protection that complies with ANSI Z87 shall be worn at all times. Safety glasses with side shields are required as a minimum.
- Sensible and safe work clothing/shoes must be worn. This means the wearing of shirts with a minimum four-inch sleeve. Shorts, cutoffs, sleeveless shirts, tank tops, sneakers, and running shoes are strictly prohibited.
- No canvas or leather sneakers (even if equipped with steel toe) or sandals will be worn. All construction boots or shoes designed to accommodate laces must be fully laced.
- Appropriate hearing protection shall be worn in work areas where levels exceed established standards.
- Suitable gloves must be worn to protect the hands from injury as appropriate for the work to be performed.
- Approved respirators must be used when excessive dust, mist, fumes, gases, or other atmospheric impurities are present.
- Self inflating PFDs will not be allowed on the project.
- Float coats are required when the water temperature is between 40F to 50F. A survival suit or a float coat and bibs are required when the water temperature is below 40F.

- Full-body safety harnesses and secured safety lanyards or retractable lifelines must be used when working from unguarded work surfaces where falls greater than six feet present a hazard. Lanyards or retractable lifelines must be secured to separate lifelines and independent connection points capable of withstanding the load of a potential fall.
- Proper personal protective equipment must be worn for welding and burning. Welding screens must be used when welding operations are in the vicinity of other employees.
- Electric insulating protective equipment, such as rubber gloves, blankets, hoses, boots, etc. shall be inspected before use.
- Proper diving PPE is to be established based on the planned operations to be performed, e.g., planting, welding, etc.

In accordance with Section 5 in the contractor HASP, a hazard/risk/exposure assessment will be provided for each major activity that will take place. Section 6 of the contractor HASP provides the JSA for each major activity, which identifies the steps, hazards, and control measures for each task. The required PPE is listed on each JSA, either in the main header as minimum required PPE and under control measures for task specific PPE, e.g., goggles.

5.2 LEVEL D PROTECTION

The minimum level of protection that will be required of project personnel will be Level D, which will be worn when site activities present no potential for dermal contact with contaminated media, and no potential for inhalation exposure exists. The following equipment will be used for Level D:

- Work clothing as prescribed by weather conditions;
- Leather safety-toe shoes or boots, meeting ANSI Z41;
- Safety glasses with permanent side shields or goggles, meeting ANSI Z87;
- USCG-approved Commercial Type I, II, or III PFD when working over or near water e.g., on a boat, barge, shoreline, dock, or bridge, and the potential for drowning exists. Each PFD shall be worn with an attachable emergency whistle and a water activated light attached to the PFD;
- Hard hat, meeting ANSI Z89, when falling object hazards are present;
- Hearing protection (if noise levels exceed 85 decibels on the a-scale (dBA), then hearing protection with a USEPA noise reduction ratio (NRR) of at least 20 dBA must be used);
- Gloves as appropriate for task (detail glove type for task in JSA); and
- Lighted reflective light-emitting diode (LED) illuminated safety vests shall be required for all personnel working near roadways, railways or moving vehicles, including heavy operating equipment, if working before dawn, after dusk or during reduced visibility, e.g., fog, overcast skies, etc. High visibility reflective safety vests or other suitable

garments approved by the CM shall be worn by all other personnel that are not working near roadways, railways, or moving vehicles.

5.2.1 Modified Level D Protection

Modified Level D PPE will be used when airborne concentrations of a chemical hazard are not present at levels of concern, but site activities present an increased potential for contact with contaminated sediment. Modified Level D protection consists of Level D PPE in addition to the following:

- Nitrile gloves worn over nitrile surgical gloves;
- Latex / polyvinyl chloride (PVC) over boots when contact with contaminated sediment is anticipated;
- Tyvek® suit when body contact with contaminated sediment is anticipated; and
- Polyethylene-coated Tyvek® suit or raingear when body contact with wet sediment or liquid contaminants is anticipated.

5.2.2 Level C Protection

Level C protection will be required when the airborne concentration of a chemical hazard reaches one-half of the OSHA PEL or American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV). Level C protection consists of Level D PPE in addition to the following:

- Full-face, air-purifying respirator with combination organic vapor and high-efficiency particulate air (HEPA) cartridges.

5.3 SELECTION OF PPE

PPE will be selected based on the potential for contact with contaminated sediment materials, site conditions, air quality, and the judgment of the PSM, SSR, or site supervisor.

5.4 SITE RESPIRATORY PROTECTION PROGRAM

Each contractor HASP will provide its own written respiratory protection program in compliance with 29 CFR 1910.134, which will consist of the following (as a minimum):

- All on-site personnel who may use respiratory protection will have an assigned respirator.
- All on-site personnel who may use respiratory protection will have been fit tested and trained in the use of a full-face air-purifying respirator within the past 12 months.
- All on-site personnel who may use respiratory protection must, within the past year, have been medically certified as being capable of wearing a respirator. Documentation of the medical certification must be provided to the PSM prior to commencement of site work.

- Respirators must be properly cleaned, maintained, stored, and National Institute for Occupational Safety and Health (NIOSH) approved.
- If air-purifying cartridge respirators are used, a calculation must be completed to determine the end of service life for the cartridge and establish a cartridge change-out schedule. Using breakthrough or changing cartridges at the end of each shift is not acceptable.
- All on-site personnel who may use respiratory protection must be clean-shaven. Mustaches and sideburns are permitted, but they must not touch the sealing surface of the respirator.
- Respirators will be inspected, and a negative pressure test performed prior to each use.
- After each use, the respirator will be wiped with a disinfectant, cleansing wipe. When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location, in a manner that will not distort the face piece.

5.5 USING PPE

Depending on the level of protection selected, specific donning and doffing procedures may be required. The procedures presented in this section are mandatory if Modified Level D or Level C PPE is used.

5.5.1 Donning Procedures

Use the following procedures when donning PPE:

- Remove bulky outerwear, remove street clothes, and store in clean location.
- Put on work clothes or coveralls.
- Put on the required chemical protective coveralls.
- Put on the required chemical protective boots or boot covers.
- Tape the legs of the coveralls to the boots with duct tape.
- Put on the required chemical protective gloves.
- Tape the wrists of the protective coveralls to the gloves.
- Don the required respirator and perform appropriate fit check (Level C).
- Put hood or head covering over head and respirator straps and tape hood to face piece (Level C).
- Don remaining PPE, such as safety glasses or goggles and hard hat.

5.5.2 Doffing Procedures

Whenever a person leaves the exclusion zone (EZ) of a particular work area, the following decontamination sequence must be followed:

- Rinse contaminated materials from the boots or remove contaminated boot covers.

- Clean reusable protective equipment.
- Remove protective garments, equipment, and respirator (Level C). All disposable clothing should be placed in plastic bags, which are labeled with contaminated waste labels.
- Wash hands, face, and neck (or shower if necessary).
- Proceed to clean area and dress in clean clothing.
- Clean and disinfect respirator for next use.

All disposable equipment, garments, and PPE must be bagged in plastic bags and labeled for disposal. See Section 9, Decontamination, for detailed information on decontamination stations.

5.5.3 Selection Matrix

The level of PPE selected will be based on air monitoring of the work environment and an assessment of the potential for skin contact with contaminated media. The PPE selection matrix is presented in Table 3 below.

Table 3 – PPE Selection Matrix

Task	Anticipated Level of PPE for Task Initiation
Rail Yard Operations	Modified Level D
Processing Facility Upgrades/Construction	Modified Level D or Level D
Processing Facility Operations	Modified Level D
Dredging Operations	Modified Level D
Habitat Construction	Modified Level D
Support Activities	Modified Level D
Decontamination/Equipment Cleaning Activities	Modified Level D

Note: Please refer to the *Diving Safety Manual* (Appendix C) for a description of scuba equipment to be used.

SECTION 6

AIR MONITORING AND ACTION LEVELS

6.1 AIR MONITORING

Assessment and evaluation of field personnel exposure to airborne contaminants through real-time and integrated monitoring shall be performed by each contractor as per the contractor HASP, concurrent with activities which may possibly generate airborne contaminants approaching established exposure limits (PEL, ACGIH TLV). PCBs are the primary contaminant of concern on the project; however, other contaminants, e.g., metals, may be encountered in the course of river dredging. The sediment coring program has also identified metals (Cr, Cd, As, Hg) from an upstream pigment plant. Therefore, the contractor must review all sediment data and address any appropriate controls in the development of the contractor HASP. The contractor HASP and air monitoring plan may have to be reevaluated should other discoveries be made. A discussion of potential air contaminants is presented in the following sections.

6.2 POLYCHLORINATED BIPHENYLS (PCBs)

PCBs have very high boiling points and exhibit low volatility. Site work will take place outdoors or indoors with adequate ventilation. There is very little potential for PCB vapor generation above the PEL, and very little potential for airborne particulate generation during project activities, as PCBs have a strong affinity for sediment and the sediment will be wet. If airborne particulates, e.g., dust, are generated during the dewatering process or transferring of coarse material to the staging area, dust suppression measures will be implemented by the contractor. Contractors will be required to closely monitor emission levels as community level exposure limits are much lower than employee limits. The contractor is responsible for maintaining community level exposure at or below the QoLPS limits.

6.3 AIRBORNE PARTICULATES (DUST)

Real-time aerosol monitors will be used by contractors to monitor the level of airborne particulates. Perimeter, point source, and personnel air monitoring will also be required.

6.4 GASOLINE AND SOLVENTS

Standard safety procedures will be followed when handling gasoline and solvents to minimize vapor generation and inhalation exposure. Safety containers will be capped and stored outside in a manner that provides adequate ventilation and minimizes the risks of release, fire, or explosion. Potential exposures are of very short duration.

6.5 HYDROGEN SULFIDE

Dredging in areas of heavy organic sediments may release hydrogen sulfide. The dredging contractor will be required to monitor hydrogen sulfide and combustible gasses with a combustible gas indicator with a hydrogen sulfide detector. Action levels for hydrogen sulfide will be established as per Section 6.7. Contractors will be required to closely monitor emission levels as community level exposure limits are much lower than employee limits. The contractor is responsible for maintaining community level exposure at or below the QoLPS limits.

6.6 RESPIRATORY HAZARD ASSESSMENT

The PSM will perform a respiratory hazard assessment, which will include a review of each contractor HASP and corresponding JSA.

6.7 ACTION LEVELS

When real-time air monitoring cannot be performed for all potential chemicals of concern, theoretical exposure limits based on a worst-case scenario shall be calculated using dust as an action level, which cannot exceed 1.0 milligram per square meter (mg/m^3). Action levels may be adjusted based on the data obtained over the duration of the project.

When determining whether employees are approaching established exposure limits, exposures and corresponding PEL must be calculated based on the number of hours worked, e.g., 12 hours versus the traditional eight-hour PEL or TLV.

When there is a difference between one or more published exposure limits for a chemical of concern, e.g., OSHA PEL and ACGIH TLV, the more conservative exposure limit will be used for determining an action level.

SECTION 7

MEDICAL MONITORING

7.1 MEDICAL SURVEILLANCE PROGRAM

All project personnel who work in areas that may result in the exposure to chemicals at or above the PEL, are members of a hazmat team, or who wear a respirator for more than 30 days per year shall participate in a medical surveillance program in compliance with 29 CFR 1910.120(f). Copies of the documentation required as part of 29 CFR 1910.120(f) shall be provided by each contractor to the PSM.

7.1.1 Pre-Placement Medical Examination

All project personnel operating motor vehicles or heavy equipment associated with the project, including dredge cranes and operating vehicles off-site for project purposes, shall pass a functional capacity examination (FCE) prior to starting work that shall include:

- 20/20 vision to perceive or recognize distances, depths, and peripheries;
- Audiogram results indicating the ability to hear audible instructions via two-way radio;
- Ability to move the head and neck sideways for increased peripheral vision; and
- Ability to ascend/descend fixed ladders and stairs.

All on-site personnel involved with lifting, carrying, pushing, or pulling equipment and materials that weigh up to 40 pounds shall have an FCE to confirm they are physically fit to perform their job.

All on-site personnel involved with dredging, processing, and handling PCB-impacted sediments shall have a baseline, annual and exit examinations in compliance with 29 CFR 1910.120(f) to identify any pre- or post-exposure medical conditions.

The examining physician shall provide the employee with a letter summarizing his findings and recommendations, confirming the worker’s fitness for work and ability to wear a respirator.

7.2 OTHER MEDICAL EXAMINATIONS

Each diver must be certified by a licensed physician to be medically qualified for their assignment before diving. The medical examination must be documented and a written report prepared by the examining physician. The medical examination must contain the examining physician’s opinion of the individual’s fitness to dive, including any recommended restrictions or limitations. The report must be reviewed by the Diving Supervisor.

In addition to pre-employment, annual, and exit physicals, personnel may be examined:

- At employee request after known or suspected exposure to toxic or hazardous materials; or

- At the discretion of the PSM, SSR, or occupational physician in anticipation of or after known or suspected exposure to toxic or hazardous materials.

7.3 MEDICAL RESTRICTION

When the examining physician identifies a need to restrict work activity, the employee's supervisor must communicate the restriction to the employee and the site supervisor, who will communicate the information to the PSM. The terms of the restriction will be discussed with the employee and the supervisor.

Alternate, light-duty work will be made available to personnel whenever possible.

SECTION 8

PERSONNEL TRAINING

8.1 GENERAL

Below is a table that details the training requirements for onsite personnel.

Personnel / Type of Training	Project Safety Orientation	Behavior -based Safety	HAZWOPER 40-hr	Zero Incident	CPR/ First Aid	OSHA 10-hr	Defensive Driving	Controlled Substance / Alcohol Abuse Awareness	Incident Investigation Training
Visitors (including regulatory personnel)	Yes	No	No (must be escorted by HAZWOPER trained personnel)	No	No	No	No	No	No
GE Site Project Personnel	Yes	Yes	Yes (for Processing, Dredging and Habitat Const.)	Yes	No	No	No	No	No
CM Site Project Personnel	Yes	Yes	Yes (for Processing, Dredging and Habitat Const.)	Yes	Yes (for Safety personnel)	Yes (for Safety person nel)	Yes (if driving for business)	Yes	Yes
Contractor Managers, Supervisors and Safety Personnel	Yes	Yes	Yes (for Processing, Dredging and Habitat Const.)	Yes	Yes	Yes	Yes (if driving for business)	Yes (biannually)	Yes
Contractor Field/Craft	Yes	Yes	Yes (for Processing, Dredging and Habitat Const.) see note 1 below	No	Yes (for SSR)	Yes (for SSR)	Yes (if driving for business)	No	No

Note 1: Contractor and subcontractor field personnel who work in areas that may result in exposure to hazardous substances or health hazards must be trained in compliance with 29 CFR 1910.120 (HAZWOPER).

All project personnel shall attend a site-specific project safety orientation upon hire that will review the Zero Incident management approach; the project team's proactive approach to manage the interrelated areas of safety, health, environment, and risk management; and the project goal of zero accidents and zero injuries with work tasks designed to minimize or eliminate hazards to personnel, process, equipment, environment, and the general public. In addition, it will be reinforced that no individuals shall perform tasks that may endanger their own safety and health or that of others. In other words, all individuals are empowered to have "stop work authority". Visitors will also be required to receive an abbreviated project safety orientation.

The site-specific project safety orientation for all project personnel will also discuss behavior-based safety, the benefits of behavior-based safety, and how to conduct a worker safety observation and participate in a feedback session to identify positive and questionable behaviors.

All on-site personnel will receive training on the effects and consequences of controlled substance use on personal health, safety, and work environment.

All project personnel that drive any type of vehicle on or off the site for any purpose related to the project (other than driving to and from a place of residence for work) shall complete a full day (eight hours) defensive driving course and provide documentation.

All on-site personnel who work in areas that may result in the exposure to hazardous substances or health hazards must be trained in compliance with 29 CFR 1910.120 (HAZWOPER standard). Certification must be renewed on an annual basis by completing an eight-hour refresher.

8.2 40-HOUR OSHA HAZWOPER COURSE

The following is a list of the topics typically covered in the 40-hour HAZWOPER training:

- General safety procedures;
- Physical hazards (fall protection, noise, heat stress, cold stress);
- Names and job descriptions of key personnel responsible for site health and safety;
- Safety, health, and other hazards typically present at hazardous waste sites;
- Use, application, and limitations of PPE;
- Work practices by which project personnel can minimize risks from hazards;
- Safe use of engineering controls and equipment on site;
- Medical surveillance requirements;
- Recognition of symptoms and signs that might indicate overexposure to chemicals;
- Worker right-to-know (Hazard Communication, 29 CFR 1910.1200);
- Routes of exposure for chemicals of concern;
- Engineering controls and safe work practices;
- Components of a health and safety program and a site-specific HASP;
- Decontamination practices for personnel and equipment;
- Confined-space entry procedures; and
- General emergency response procedures.

8.3 SUPERVISOR TRAINING

Management and supervisors must complete the following courses:

- Eight-hour HAZWOPER supervisor;
- Thirty-hour OSHA construction safety course;
- START – behavior-based safety training;
- Controlled substance and alcohol awareness training on the manifestations and behavioral causes that may indicate controlled substance and alcohol use or abuse (required on at least a biannual basis); and
- CPR/first aid.

8.4 SITE-SPECIFIC TRAINING

A project orientation session covering site hazards, procedures, and contents of the RA HASP must be received by all on-site personnel prior to commencement of work or entering the site. The orientation shall include a discussion of the chemical, physical, and biological hazards; names of personnel responsible for site safety and health; proper use of personal protective equipment; work practices to minimize risk from hazards; safe use of engineering controls and equipment; acute effects of compounds at the site; decontamination procedures; and emergency procedures.

8.4.1 Visitors

A visitor is an individual that is not permanently assigned to the project, has not received a project safety orientation or does not have the required training certifications to work on the site.

Visitors arriving on the site must be escorted at all times by the PSM, CM safety representative, or site supervisor, or must receive the site-specific project safety orientation and have the appropriate training certifications, e.g., HAZWOPER certification.

8.4.2 Safety "Toolbox" Meetings

Safety "toolbox" meetings conducted prior to each shift will cover the current weather and site conditions, incidents from the previous shift, safe or at-risk/questionable behaviors from the previous shift, work to be accomplished, anticipated hazards, engineering controls/work practices/PPE to protect against hazards and any additional safety topics. No work will be performed before the safety "toolbox" meeting has been held. The safety "toolbox" meeting must also be held prior to new tasks, and repeated if new hazards are encountered. Safety "toolbox" meetings shall be documented on the safety meeting sign-in sheet provided as Attachment C, or equivalent. All project personnel arriving on site after the safety "toolbox" meeting must review the contents of the meeting and sign the sheet.

8.5 FIRST AID AND CPR

At least two employees current in first aid/CPR will be assigned to each work crew carrying out a specific field task and will be on the site during operations. These individuals must also receive training regarding the precautions and protective equipment necessary to protect against exposure to blood-borne pathogens.

8.6 BOAT OPERATORS

The operator/skipper of any boat, e.g., barge, tug, dredge, support vessel, etc., must complete a USCG boating safety training course prior to conducting work on the river. Each operator/skipper must demonstrate proficiency in the following subject areas: proper operation of a boat; boat and safety equipment inspections; content and frequency of equipment safety inspections; proper use of on-board safety equipment, including fire extinguisher, radio or cellular phone, flares, and horn; proper procedures on the completion and filing of a float plan; appropriate boating “rules-of-the-road”; emergency procedures in the event of capsizing or being thrown overboard; and different types of PFDs and their proper inspection and use.

8.7 COMPETENT PERSON

Contractors are individually responsible for training their respective workers and for complying with all project requirements. Table 4 below provides some guidance on competent/qualified person, training, and JSA requirements for specific safety and health regulations.

Table 4 Competent Person and Job Safety Analysis Requirements

Safety and Health Requirement	OSHA Regulation	Competent/ Qualified Person	Training Required	Written Plan and JSA Required
General Safety and Health	1926.20	*Yes*	*Yes*	*Yes*
Safety Training	1926.21	*Yes*	*Yes*	*Yes*
Confined Spaces	1926.21, 1910.147	*Yes*	*Yes*	*Yes*
Confined Space Permit System	See above	*Yes*	*Yes*	*Yes*
First Aid and Medical	1926.23, 50	*Yes*	*Yes*	*Yes*
Fire Protection and prevention	1926.24, 150-155, 352	*Yes*	*Yes*	*Yes*
Housekeeping	1926.25	*N/A*	*N/A*	*N/A*

Table 4 (Continued)
Competent Person and Job Safety Analysis Requirements

Safety and Health Requirement	OSHA Regulation	Competent/ Qualified Person	Training Required	Written Plan and JSA Required
Illumination	1926.26, 56	*Recommended*	*N/A*	*N/A*
Sanitation	1926.27, 51	*N/A*	*N/A*	*N/A*
Personal Protective Equipment	1926.28, 95-98, 100-107	*Yes*	*Yes*	*Yes*
Acceptable Certifications	1926.29	*Yes*	*Yes*	*Yes*
Incorporation by Reference	1926.31	*N/A*	*N/A*	*N/A*
Emergency Employee Action Plans	1926.35	*Recommended*	*Yes*	*Yes*
Noise Exposure	1926.52	*Yes*	*Yes*	*Yes*
Radiation Protection	1926.53, 54	*Yes*	*Yes*	*Yes*
Gases, Vapors, Dusts, and Mists	1926.1926.55	*Yes*	*Yes*	*Yes*
Ventilation	1926.57, 353	*Recommended*	*Yes*	*Yes*
Hazard Communication	1926.59	*Yes*	*Yes*	*Yes*
Process Safety Management	1926.64 1910.119	*Yes*	*Yes*	*Yes*
Hazardous Waste Operations and Emergency Response	1926.65 1910.120	*Yes*	*Yes*	*Yes*
Accident Prevention Signs and Tags	1926.200	*N/A*	*N/A*	*N/A*
Signaling	1926.201	*Recommended*	*N/A*	*Yes*
Barricades	1926.202	*N/A*	*N/A*	*N/A*
Material Storage	1926.250	*N/A*	*Yes*	*Yes*
Rigging	1926.251	*Yes*	*Yes*	*Yes*
Waste Disposal	1926.252	*Yes*	*Yes*	*Yes*
Tools	1926.300-307	*N/A*	*N/A*	*Yes*
Gas Welding and Cutting	1926.350	*Recommended*	*Yes*	*Yes*
Arc Welding	1926.351	*Recommended*	*Yes*	*Yes*
Electrical	1926.400-415	*Yes*	*Yes*	*Yes*
General Electrical	1926.416	*Yes*	*Yes*	*Yes*
Lockout/Tagout	1926.417, 1910.147	*Yes*	*Yes*	*Yes*
Lockout/Tagout Permit System	See above	*Yes*	*Yes*	*Yes*
Maintenance of Electrical Equipment	1926.431	*Yes*	*Yes*	*Yes*

Table 4 (Continued)
Competent Person and Job Safety Analysis Requirements

Safety and Health Requirement	OSHA Regulation	Competent/ Qualified Person	Training Required	Written Plan and JSA Required
Environmental Deterioration of Electrical Equipment	1926.432	*Yes*	*Yes*	*Yes*
Batteries/Battery Charging Equipment	1926.441	*N/A*	*Yes*	*Yes*
Scaffolding	1926.450-454	*Yes*	*Yes*	*Yes*
Aerial Lifts	1926.453	*Yes*	*Yes*	*Yes*
Fall Protection	1926.500-503	*Yes*	*Yes*	*Yes*
Cranes, Derricks, Hoists, Elevators, and Conveyors	1926.550	*Yes*	*Yes*	*Yes*
Motor Vehicles, Mechanized Equipment	1926.600-603	*Yes*	*Yes*	*Yes*
Powered Industrial Trucks (forklifts)	1910.178	*Yes*	*Yes*	*Yes*
Site Clearing	1926.604	*N/A*	*Yes*	*Yes*
Marine Operations and Equipment	1926.606	*Yes*	*Yes*	*Yes*
Excavations	1926.650-652	*Yes*	*Yes*	*Yes*
Excavation Permit	N/A	*Yes*	*Yes*	*Yes*
Concrete and Masonry Construction	1926.700-706	*Yes*	*Yes*	*Yes*
Steel Erection	1926.750-761 and SENRAC	*Yes*	*Yes*	*Yes*
Underground Construction	1926.800	*Yes*	*Yes*	*Yes*
Caissons	1926.801	*Yes*	*Yes*	*Yes*
Cofferdams	1926.802	*Yes*	*Yes*	*Yes*
Compressed Air	1926.803	*Yes*	*Yes*	*Yes*
Demolition	1926.850-860 inclusive	*Yes*	*Yes*	*Yes*
Power Transmission and Distribution	1926.950-960 inclusive	*Yes*	*Yes*	*Yes*
Rollover Protective Structures; Overhead Protection	1926.1000-1003 inclusive	*N/A*	*N/A*	*Yes*
Stairways and Ladders Scope	1926.1050	*N/A*	*Yes*	*Yes*
S/L General Requirements	1926.1051	*Yes*	*Yes*	*Yes*
Stairways	1926.1052	*Recommended*	*Yes*	*N/A*
Ladders	1926.1053	*Yes*	*Yes*	*Yes*

Table 4 (Continued)
Competent Person and Activity Hazards Analysis Requirements

Safety and Health Requirement	OSHA Regulation	Competent/ Qualified Person	Training Required	Written Plan and JSA Required
Ladder/Stair Training	1926.1060	*Yes*	*Yes*	*Yes*
Diving Scope	1926.1071-1072	*Yes*	*Yes*	*Yes*
Dive Team Quals	1926.1076	*Yes*	*Yes*	*Yes*
Dive Safe Practices Manual	1926.1080	*Yes*	*Yes*	*Yes*
Predive Procedures	1926.1081	*Yes*	*Yes*	*Yes*
Procedures During Dive	1926.1082	*Yes*	*Yes*	*Yes*
Post Dive Procedures	1926.1083	*Yes*	*Yes*	*Yes*
SCUBA Diving	1926.1084	*Yes*	*Yes*	*Yes*
Surface-Supplied Air Diving	1926.1085	*Yes*	*Yes*	*Yes*
Mixed-gas Diving	1926.1086	*Yes*	*Yes*	*Yes*
Liveboating	1926.1087	*Yes*	*Yes*	*Yes*
Diving Equipment	1926.1090	*Yes*	*Yes*	*Yes*
Diving Recordkeeping Requirements	1926.1092	*Yes*	*Yes*	*Yes*
Internal Traffic Control	N/A	*N/A*	*Yes*	*Yes*
Traffic Movement Restriction Times	N/A	*N/A*	*Yes*	*Yes*
Line Breaking	1910.119 and 1926.54	*Yes*	*Yes*	*Yes*
Major Material Movements	N/A	*N/A*	*Yes*	*Yes*
Right-of-way Restrictions	N/A	*N/A*	*Yes*	*Yes*

SECTION 9

DECONTAMINATION

9.1 CONTAMINATION CONTROL ZONES (CCZ)

Contamination control zones must be defined and maintained in each potentially contaminated work area to prevent the spread of contamination and to prevent unauthorized people from entering potentially hazardous areas.

9.1.1 Exclusion Zone (EZ)

An EZ may consist of a specific work area, or may be an entire area of potential contamination. All personnel entering an EZ must use the required PPE, and must have the appropriate training and medical clearance. The EZ is the defined area where there is a possible respiratory and/or contact health hazard. Cones, caution tape, or a site diagram may be used to identify the location of each EZ.

9.1.2 Contamination Reduction Zone (CRZ)

A CRZ or transition area will be established as needed to perform decontamination of personnel and equipment. All personnel entering or leaving the EZ will pass through this area to prevent any cross-contamination. Tools, equipment, and machinery will be decontaminated in a specific location. The decontamination of all personnel will be performed on site adjacent to the EZ. Personal protective outer garments and respiratory protection will be removed in the CRZ and prepared for cleaning or disposal. This zone is the only appropriate corridor between the EZ and the Support Zone.

9.1.3 Support Zone (SZ)

The SZ is a clean area outside the CRZ to prevent employee exposure to hazardous substances. Eating and drinking will be permitted in the SZ only after proper decontamination. Smoking may be permitted in designated areas of the SZ, subject to site requirements.

9.2 PERSONNEL DECONTAMINATION

All personnel wearing Modified Level D or Level C PPE in an EZ must undergo decontamination prior to entering an SZ, in compliance with 29 CFR 1910.120(k). The personnel decontamination area will consist of the following stations at a minimum:

- *Station 1*: Personnel leaving the CZ will remove the gross contamination from their outer clothing and boots.
- *Station 2:* Personnel will remove their outer garment and gloves and dispose of them in properly labeled containers. Personnel will then decontaminate their hard hats and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items will then be hand carried to the next station.

- *Station 3:* Personnel will thoroughly wash their hands and face before leaving the CRZ. Respirators will be sanitized and then placed in a clean plastic bag.

Personnel working on marine equipment shall decontaminate prior to accessing a support vessel for transportation to the support marina. Personnel shall wash hands, face, and other exposed skin areas prior to work breaks and eating.

No work clothing, shoes, or boots that have come into contact with contaminated sediment shall be worn or carried out of the project area unless they have been decontaminated.

9.3 EQUIPMENT DECONTAMINATION

All vehicles and equipment that have entered a potentially contaminated area will be visually inspected and, if necessary, decontaminated prior to leaving the area. If the visible level of vehicle contamination is low, decontamination may be limited to rinsing tires and wheel wells with water. If the vehicle has visible gross contamination, steam cleaning or pressure washing may be required. Rinsate from all decontamination activities will be collected or contained for proper treatment and/or disposal.

All barges and associated marine equipment shall be decontaminated of any visible sediment before being sent to the working wharf for repairs and/or maintenance.

9.3.1 PPE Decontamination

Where and whenever possible, single-use, external protective clothing must be used for work within the EZ or CRZ. This protective clothing must be disposed of in properly labeled containers. Reusable protective clothing will be rinsed at the site with detergent and water. The rinsate will be collected or contained for proper treatment and/or disposal.

When removed from the CRZ, the respirator will be thoroughly cleaned with soap and water. The respirator face piece, straps, valves, and covers must be thoroughly cleaned at the end of each work shift and ready for use prior to the next shift. Respirator parts may be disinfected with a solution of bleach and water or by using a spray disinfectant.

SECTION 10

EMERGENCY RESPONSE

10.1 GENERAL

This section presents emergency response procedures, including specific fire and spill response protocols, along with information pertaining to medical and first aid emergencies and injury, illness, and near-miss reporting requirements.

Each work area will be evaluated for the potential for fire, explosion, chemical release, or other emergency. An evacuation route from each specific work area must be identified prior to beginning work in the area.

Unusual events, activities, chemicals, and conditions must be reported to the site supervisor immediately.

10.2 EMERGENCY RESPONSE

If an incident that requires emergency response occurs, the site supervisor must take the following steps:

- Evaluate the incident and assess the need for assistance and/or evacuation;
- Call for outside assistance as needed;
- Notify the PSM and appropriate SSR of the incident;
- Notify GE and its representatives of the incident; and
- Take appropriate measures to stabilize the incident scene and ensure that the situation will not affect other areas.

Periodic drills will be conducted involving project personnel and external emergency responders. Specific drill requirements and scheduling will be identified in the pre-planning process, and drills will be held at least annually. Drills will consist of a simulated fire, medical and water-based response, as well as a table-top drill. A formal critique and discussion will be conducted for each of the drills.

10.2.1 Notifications

In the event of an incident that requires emergency response, project personnel will immediately notify 911 so that the proper emergency personnel can respond. Following the 911 call, a project-specific "Priority" will be issued to project personnel over the two-way radio. These priorities were developed with local emergency responders based on the expected capabilities of project personnel and external responders. The priorities are as follows:

- **Priority 1** — Call "911"; external response required. These include the following types of incidents:

   - traumas (either with or without exposure), e.g., fractures, open wounds, or falls from elevation;
   - life-threatening incidents (either with or without exposure), e.g., injured individual is unconscious, severely bleeding, not breathing or has chest pains;
   - chemical releases, e.g., a visible plume or exposure causing eye or throat irritation;
   - fires - either controllable or uncontrollable; and
   - sinking or capsized boats.
- **Priority 2** - Internal response with first aid supplies to provide basic life support, including minor medical injuries, e.g., abrasions, lacerations, eye irritations, etc.
- **Priority 3** - Internal response with spill supplies, including liquid spills within a containment system or to the ground or water.
- **Priority 4** - Internal response with support boat/marine vessel.
- **Priority 5** - Call Canadian Pacific Railway. Off-site incidents involving rail cars will be the responsibility of the rail carrier, working with local emergency responders.

The same personnel that called the "Priority" will notify the PSM, the appropriate area Safety Representative, i.e., dredging or facility operations, and other project safety personnel. All will respond to the scene accordingly.

If needed, air horns strategically located throughout the facility and on each project vessel will initiate the evacuation signal - one long blast.

The PSM or designee will act as the incident commander for project emergencies that are handled internally. Trained on-site personnel will use fire extinguishers for small fires, and first aid/CPR-trained personnel will provide treatment for non-life threatening injuries.

In the event of an emergency requiring external emergency response, the first responding agency's lead officer will become the incident commander after he or she arrives on site. The Project Safety Manager will serve as liaison to the external incident commander, as appropriate.

Appropriate emergency response measures will immediately be taken by project personnel to assist those who have been injured and to protect others from unsafe conditions. These measures may include contacting the relevant authorities (depending on the nature of the emergency) and/or health care facilities (see emergency contact numbers listed in Attachment A). It may also involve moving individuals to a secure location, as appropriate. On-site first-aid to an injury or illness will be provided by trained personnel. External emergency responders will be responsible for providing advanced life support services.

If an incident involves a fire that cannot be controlled with an extinguisher, the work area and/or vessel will be evacuated immediately. The PSM (or on-site designee) will promptly contact external fire department personnel whenever there is a fire, regardless of its intensity.

Upon the occurrence of any event during the performance of the work which requires reporting to the National Response Center (NRC) under Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), such reporting will be made by GE or their designee. GE will notify USEPA and New York State Department of Environmental Conservation (NYSDEC) of any incident that may present an immediate threat to public health or welfare or the environment, by immediately (upon obtaining knowledge of the incident) notifying USEPA's team leader, or, in the event of the unavailability of the team leader, the USEPA project coordinator or alternate USEPA project coordinator; and also notifying the NYSDEC project manager, or, in the event of the unavailability of the NYSDEC project manager, the Chief of NYSDEC's Hudson River Unit or the New York State Department of Health (NYSDOH) Bureau of Environmental Exposure Investigation.

If any action or occurrence during the performance of the work causes or threatens to cause a release of a hazardous substance that may present an immediate threat to public health or welfare or the environment, the USEPA and the NYSDEC will be notified by GE or its designee immediately on obtaining knowledge of such action or occurrence. Such notifications will be made to one of the USEPA project coordinators and to the NYSDEC Hudson River project manager (or, in the event of their unavailability, to their alternate contacts).

The following subsections present procedures for fire response and spill prevention/ response.

10.2.2 Fire Response

All personnel are trained in the use of fire extinguishers during the Project Safety Orientation and instructed to use a fire extinguisher for incipient stage fires only.

In the event of a fire at the sediment processing facility, a telephone call will be made to 911 regardless of whether the PSM (or on-site designee) determines a need for external response. The arriving unit will report to the designated entry location and will be met by the PSM (or on-site designee) and briefed. The CM staff will provide the lead officer with facility-specific information and logistical support, as needed.

In the event of an incipient stage fire affecting river-based operations, the dredging contractor's personnel will attempt to extinguish the fire with onboard equipment (typically fire extinguishers). If a fire cannot be extinguished by dredging personnel, then they will call 911 and follow emergency response procedures, including abandoning the vessel if necessary. The lead officer will respond to a designated location, will be met by the PSM (or on-site designee) and briefed. Based on the incident, the lead officer will deploy appropriate water rescue resources with the assistance of project personnel. The CM staff will assist external responders with operational support, e.g., stopping dock work and barge movement, and by providing assistance, e.g., boats, vehicles, and/or PPE.

10.2.3 Spill Prevention/Response

In the event of a spill, response actions will be primarily guided by the spill prevention, control, and countermeasure (SPCC) plans prepared by the dredging contractor (for in-river activities) and the processing facility contractor (for incidents on the main site). These contractor SPCC Plans will be prepared after 2011 contractor award and prior to commencing 2011 dredging and facility operations. For the purposes of this RA HASP, a general response approach has been summarized below.

In the event of an accidental release of a toxic or hazardous material, the employee observing the incident must immediately notify the site supervisor, and if possible, proceed to control the emergency situation.

When determining the possible hazards to human health and/or the environment that may result from the incident, the PSM must consider both the direct and indirect effects of the release, assess the possible effects of any toxic, irritating, or asphyxiating gases that are generated, and determine the effects of any hazardous run-off from water or chemical agents used to control fire and heat-induced explosions.

10.2.3.1 Spill Response Procedures – Sediment Processing Facility

Spills at the processing facility within the exclusion zone are captured within the built-in collection, containment, and treatment system designed to effectively address dredged and processed materials. A significant accident or spill of material could warrant immediate actions by the facility contractor to protect human health and safety, assess the severity of the event, and take appropriate mitigation measures, if needed. The event would be evaluated by the CM and contractor to determine its causes and future prevention, and proper project authorities would be notified of the event.

Generally, on-site sediment spills from a project truck will be picked up and placed back in the truck, while sediment spills during the process of loading rail cars will be picked up and placed into the rail car.

10.2.3.2 Spill Response Procedures – In River Activities

All project vessels will be required to have USCG safety equipment, including ship-to-shore very-high-frequency (VHF) radios and cellular phones to alert the CM and local responders of a spill.

The responders' first priority will be to assess the safety, rescue, or medical needs of members of the public and workers immediately affected by the spill.

At the same time, the apparent scale and severity of the spill will be evaluated so that appropriate response actions can be taken. Notification to the CM will be promptly made. The CM will aid in summoning the contractor's spill response team or other support personnel. In all cases, the location and time of the spill, the vessels and people involved, and other important details will be conveyed to assist response actions and reporting.

Third, the spill will be contained and controlled. If the spill appears incidental, e.g., brief duration and of limited spatial extent, containment may not be necessary or feasible. If the spill is of a larger magnitude (larger quantity, longer duration or spatial extent), contingency measures will be implemented per the SPCC plan, once developed. These measures will include actions to contain and control the spill to the extent possible, e.g., safe, feasible, consistent with other project requirements, thereby stopping the spill, securing and stabilizing the immediate area, and taking steps to minimize the spread of the spill.

Fourth, the spill will be cleaned up or mitigated. A pre-planned course of action for the recovery of any spilled material containing PCBs will be implemented.

10.2.3.3 Spill Reporting Requirements

This section applies only to spills and releases within the Sediment Processing Facility or on the river. Reporting and responding to off-site accidents involving a release from loaded rail cars is the responsibility of the rail carriers.

Federal and state laws and regulations define when a spill or release must be reported. Pursuant to its authority under the CERCLA, USEPA has developed a list of hazardous substances that, if released to the environment in an amount greater than a defined reportable quantity (RQ), must be reported. For example, in the case of PCBs, the person in charge of a facility must immediately report upon learning that one pound or more of PCBs has been released to the environment within a 24-hour period.

Under its authority granted by the Federal Water Pollution Control Act (FWPCA), USEPA has developed a similar list of reportable quantities of hazardous substances in the event of a release of hazardous substances to the navigable waters. As with the CERCLA list, these require reporting if an amount exceeding an RQ is spilled into the water. In addition, the Oil Pollution Act (OPA) requires notification if a sheen of oil is visible on the water. Oil sheens generated as a result of sediment and debris removal are not subject to this reporting requirement.

Under state law, NYSDEC has developed its own list of hazardous substances that, if released to the environment, must be reported. That law (6 NYCRR Part 595, 597) requires the reporting of releases above a defined RQ (in the case of PCBs, one pound or more) to NYSDEC immediately, but within two hours after the discharge. State law also requires reporting of releases involving less than the RQ if the release may result in fire, explosion, exceedance of air and water quality standards, or injury to the public.

In addition, Section 17-1743 of the NYSDEC Law requires that a person who stores more than 1,000 gallons of any liquid (including petroleum) must immediately report any release of the liquid to land or waters.

Finally, New York's Navigation Law requires any person responsible for causing a discharge of oil or other petroleum to land or water notify NYSDEC immediately, but within two hours after the discharge, unless: (1) the spill is less than 5 gallons; (2) the spill is contained;

(3) the spill has not and will not reach the water or any land; and (4) the spill is cleaned up within two hours of discovery.

If the release or spill requires reporting under CERCLA, the FWPCA, or the OPA, a telephone call will be placed to the National Response Center. Additional reports are required by Paragraph 41 of the consent decree. Under that paragraph, if a release must be reported under CERCLA, then GE is also required, within 24 hours of obtaining knowledge of the onset of the event, to orally notify USEPA's team leader, Hudson River Team, Emergency and Remedial Response Division, USEPA Region 2; or, in the event that the team leader is not available, either the USEPA project coordinator or the alternate USEPA project coordinator). GE is also required to provide oral notification to the NYSDEC project manager, Hudson River PCBs Superfund Site; or, in the event of the unavailability of the NYSDEC project manager, to the chief of NYSDEC's Hudson River Unit and to the NYSDOH Bureau of Environmental Exposure Investigation. If a spill has potential to impact navigation, GE will notify the NYSCC Canal Corporation/Thruway Dispatcher.

At a minimum, personnel reporting a spill or release must provide the following information to the site supervisor (using the Incident/Near-Miss Investigation Report provided as Attachment F, or equivalent):

- Location of the release or threatened release;
- The material released or threatened to be released;
- The approximate quantity and concentration of the release or threatened; and
- Any other information as required for compliance with NRC or NYSDEC reporting requirements (NYSDEC, 1996).

The contractor's supervisor will then contact the CM and notify them of the incident. The CM's project manager will notify GE and its representatives of the incident and determine if reports to the NRC or NYSDEC are required.

10.3 EMERGENCY INFORMATION

The means to summon local public response agencies such as police, fire, and ambulance will be reviewed in the project orientation. Emergency contacts are listed in Attachment A. The following sub-sections provide information on medical emergencies and first aid while working at the site.

10.3.1 First Aid

First aid will be provided by trained personnel. Injuries and illnesses requiring medical treatment must be documented. The site supervisor must conduct an incident investigation as soon as emergency conditions no longer exist and first-aid and/or medical treatment has been administered. The report must be completed and submitted to the PSM and appropriate SSR within 24 hours after the incident.

If first-aid treatment is required, first-aid kits are kept at the CM office trailer and in each construction vehicle assigned to a supervisor. If treatment beyond first aid is required, the injured should be transported to the medical facility. If the injured is not ambulatory, or shows any sign of not being in a comfortable and stable condition for transport, then an ambulance/paramedic should be summoned. If there is any doubt as to the injured worker's condition, it is best to let the local paramedic or ambulance service examine and transport the worker.

10.3.1.1 Emergency Care Steps

The steps listed below must be followed in the event of an injury at the site:

- *Survey the scene.* Determine if it is safe to proceed. Try to determine if the conditions that caused the incident are still a threat. Protect yourself from exposure before attempting to rescue the victim.
- *Do a primary survey of the victim.* Check for airway obstruction, breathing, and pulse. Assess likely routes of chemical exposure by examining the eyes, mouth, nose, and skin of the victim for symptoms.
- *Phone Emergency Medical Services (EMS).* Give the location, telephone number used, caller's name, what happened, number of victims, victims' condition, and help being given.
- *Maintain airway and perform rescue breathing* as necessary.
- *Perform CPR* as necessary.
- *Do a secondary survey of the victim.* Check vital signs and do a head-to-toe exam.
- *Treat other conditions as necessary.* If the victim can be moved, take the victim to a location away from the work area where EMS can gain access.

10.3.1.2 Inhalation

Any employee complaining of symptoms of chemical overexposure will be removed from the work area and transported to the designated medical facility for examination and treatment.

10.3.1.3 Ingestion

Call EMS and consult a poison control center for advice. If available, refer to the MSDS for treatment information, if recommended. If unconscious, keep the victim on his or her side and clear the airway if vomiting occurs.

10.3.1.4 Skin Contact

Personnel who have had skin contact with contaminated sediment will, unless the contact is severe, proceed through the decontamination zone to the wash-up area. Personnel must remove any contaminated clothing and then flush the affected area with water for at least 15 minutes. The individual should be transported to the medical facility if showing any sign of skin reddening or irritation, or if requesting a medical examination.

10.3.1.5 Eye Contact

Field personnel who have had contaminated sediment splashed in their eyes or who have experienced eye irritation while in the contaminated zone must immediately proceed to the eyewash station set up in the decontamination zone. Do not decontaminate prior to using the eyewash. Remove whatever protective clothing is necessary to use the eyewash. Flush the eye with clean running water for at least 15 minutes. Arrange prompt transport to the designated medical facility.

10.3.2 Medical Emergency – Sediment Processing Facility

In the event of a medical emergency at the Sediment Processing Facility, a telephone call will be made to 911 and the Emergency Care Steps in Section 10.3.1.1 will be followed until medical personnel arrive. The arriving unit will report to a designated entry location. The lead officer will be met by the PSM (or on-site designee) and briefed or will immediately receive injured personnel for evaluation and/or transport. In the event injured personnel cannot be moved, emergency personnel will be escorted to the incident location.

Emergency personnel will be provided with any site-specific PPE beyond their own response gear. Response personnel will have access to any on-site emergency response equipment, as needed. If the injured personnel cannot be decontaminated due to the possibility of causing further injury, the necessary PPE and supplies will be provided to protect emergency response personnel or equipment from contamination.

10.3.3 Medical Emergency – Wharf Area

In the event of an emergency, a phone call will be made to 911. The lead officer will respond to the designated location and will be met by the PSM and briefed. Based on the incident, the lead officer will deploy appropriate water rescue resources with assistance from project personnel. Project personnel will assist external responders with operational support, e.g., stopping dock work and barge movement, and by providing assistance, e.g., boats, vehicles, PPE.

10.3.4 Medical Emergency – Dredging Areas

The dredging contractor will divide the Phase 2 dredging area into specific river control zones for emergency response and navigation control. A figure will be created by the contractor to define these control zones which will be included in the contractor’s Worker HASP, to be attached in Appendix A.

In the event of an emergency, a call will be made to 911 and the designated control zone where the emergency has occurred will be identified. The lead officer will respond to the designated location. Injured personnel who are in a condition to be transported will be transferred by project vessel to a designated location. If injured personnel cannot be transported, the lead officer will go to the designated location to be greeted by the PSM and briefed. External emergency responders will be directed to the scene if using their own vessel. Response personnel will have access to project emergency equipment, including vessels, as needed. If the injured personnel cannot be decontaminated due to the possibility of causing further injury, the necessary PPE and supplies will be provided to protect emergency response personnel or equipment.

10.3.5 Water Emergency – Man Overboard

Call will be made to 911. Onboard personnel may attempt to rescue the overboard person, if it can be done safely. Arriving unit(s) will report to a designated entry location. The lead officer will be met by the PSM and briefed or will immediately receive injured personnel for evaluation and/or transport. Project support vessels, personnel, and/or equipment will be made available to external emergency responders, as well as any land-based logistics and support equipment.

10.3.5.1 – Diving Emergency

Call will be made to 911. On board personnel will assist the diver tenders as directed by emergency services in removing an injured diver. The procedures to be followed are referenced in the *Safer Practices Manual* for additional detail.

10.3.6 Emergency Contacts

The means to summon local public response agencies such as police, fire, and ambulance will be reviewed in the project orientation. These potential agencies are identified in Attachment A. A general map and directions to the Glens Falls, New York, hospital from both the Sediment Processing and Dewatering Facility and the West River Road Marine Staging Area are provided in Figure 5.

10.4 REPORTING INJURIES, ILLNESSES, AND NEAR-MISS INCIDENTS

All injuries and illnesses, however minor, will be reported to the site supervisor immediately. The site supervisor will complete an Incident/Near-Miss Investigation Report (Attachment F) and submit it to the PSM and the appropriate SSR within 24 hours.

The investigation process shall include the following elements:

1. Quickly assess incident scene
2. Assemble investigative team (Contractor and CM member)
3. Ensure that information is quickly collected, physical info, photos, sketches, interviews.
4. Review pertinent documents.
5. Interview:
   a. Principal Witnesses (people that are directly involved in the incident)
   b. Eye Witnesses (people that saw the incident occur)
   c. General Witnesses (people that were in the vicinity, before during or after the incident)
6. Through the use of an event and causal factor (E&CF) chart identify:

   a. the immediate event or condition that caused the incident (Direct Causes)
   b. the events or conditions that along with other causes increased the chance of the incident but by themselves did not cause the incident (Contributing Causes)
   c. the Contributing Causes that were chiefly responsible for the incident (Causal Factors)
7. Through the use of an Ishikawa diagram analyze each Causal Factor
8. Prepare a Corrective Action Plan that identifies:
   a. Corrective Actions needed
   b. Responsible Person for each action
   c. Expected Completion Date for each action
9. Complete a Close-out Report
10. Conduct a follow-up inspection

Contractor management will receive Incident Investigation training conducted by the CM PSM or a designated representative.

Near-miss incidents are situations in which no injury or property damage occurred, but under slightly different circumstances, an injury or property damage could have occurred. Near misses are caused by the same factors as injuries; therefore, they must be reported on the Incident/Near-Miss Investigation Report (Attachment F) and investigated in the same manner.

Incident investigations will involve labor-management teams that will document the circumstances of the injury/damage/near miss and arrive at root causes and corrective actions.

10.5 EMERGENCY EVACUATION PLAN

10.5.1 Emergency Evacuation Plan – Processing Facility

In the event of an emergency which requires site evacuation to protect the health and safety of site personnel, the PSM or his or her designee will implement the Emergency Evacuation Plan and will be designated as the on-site emergency coordinator. The Emergency Evacuation Plan procedure is to be communicated to all site workers, subcontractors, and visitors as part of the Site Safety Orientation.

The following signals will be used:

- An Alert: a 5-second siren blast, followed by a 10-second delay, which is repeated until is it no longer necessary. An alert is used for medical incidents.

  When an alert is initiated, personnel in trained first aid are to assist the PSM or his designee with the medical incident.

- An Evacuation Notice: a long siren blast that is repeated until it is no longer necessary. The Evacuation notice is to be used for possible evacuation of the processing facility.

  1. Upon determination of an emergency condition requiring a site evacuation, the PSM or his designee sounds the evacuation notice, a long siren blast that is repeated. The alarm signal will be transmitted using a powerhorn in siren mode.

In the event the alarm signal cannot be transmitted, a call tree to the site contractors will be initiated.

2. Upon hearing the evacuation notice, all personnel on-site (contractors, CM, GE and visitors) calmly proceed to and gather at the Assembly Area. The General/Site Assembly Area is located in the parking lot outside the Administrative complex buildings. Refer to Figure 3 showing the assembly area. Personnel will gather in the Assembly Area and report to their respective organizations. When proceeding to the Assembly Area, each contractor should adhere to the following requirements:
    - Shut off all machinery, if safe to do so
    - Crew leaders, SSRs and SSOs will determine the safest exit routes for employees and will determine an alternate exit if the first choice is inaccessible.
    - While proceeding to the assembly areas, crew leaders should to keep their group together. Immediately upon exit to a safe area, the crew leader will conduct another head count to verify their crew is all present.
3. Each organization will then complete a head count, verify that all employees are accounted for and report the results to the PSM.
4. If a complete site evacuation is determined to be required by the PSM, each organization will have their employees proceed to a secondary assembly point to be designated by the PSM. The primary evacuation route from the Processing Facility is the Lock 8 Way Road to the north. The secondary evacuation route is the Old Lock 8 Road to the south. The PSM will advise which evacuation route to take. Once personnel have gathered at the secondary assembly point, a second head count will be conducted and the results provided to the PSM.

When the site alarm system is activated, no additional entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the site will cease in order to allow safe exit of personnel and movement of emergency equipment. The PSM will notify all river contractors of the emergency situation and contractors will instruct vessel captains how to proceed. The site will not be re-entered until the PSM gives clearance to do so.

Drills will be held periodically to practice all of the above procedures and will be treated with the same seriousness as an actual emergency.

10.5.2 Emergency Evacuation Plan – In-River

In the event of an emergency in-river, the Emergency Response Plan – In River will require evacuation from either the Work Support Marina or an affected vessel to protect the health and safety of project personnel. The Captain of the vessel, the PSM or his designee will implement the Emergency Evacuation Plan and will be designated as the on-site emergency coordinator. The Emergency Evacuation Plan procedure is to be communicated to all river workers, subcontractors, and visitors as part of the Site Safety Orientation.

10.5.2.1 Work Support Marina Evacuation Plan

The following signals will be used at the Work Support Marina:

- An Alert: a 5-second siren blast, followed by a 10-second delay, which is repeated until is it no longer necessary. An alert is used for medical incidents.
- When an alert is initiated, personnel in trained first aid are to assist the PSM or his designee with the medical incident.
- An Evacuation Notice: a long siren blast that is repeated until it is no longer necessary. The Evacuation notice is to be used for possible evacuation of the Work Support Marina.

Upon determination of an emergency condition requiring a site evacuation, the PSM or his designee sounds the evacuation notice, a long siren blast that is repeated. The alarm signal will be transmitted using a power horn in siren mode. In the event the alarm signal cannot be transmitted, a call tree to the site contractors will be initiated.

1. Upon hearing the evacuation notice, all personnel on-site (contractors, CM, GE and visitors) calmly proceed to and gather at the Assembly Area. The Work Support Marina Assembly Area is located in the parking lot outside the Administrative complex buildings. Refer to Figure 4 showing the assembly area. Personnel will gather in the Assembly Area and report to their respective organizations. When proceeding to the Assembly Area, each contractor should adhere to the following requirements:
   - Shut off all machinery, if safe to do so.
   - Crew leaders, SSRs and SSOs will determine the safest exit routes for employees and will determine an alternate exit if the first choice is inaccessible.
   - While proceeding to the assembly areas, crew leaders should to keep their group together. Immediately upon exit to a safe area, the crew leader will conduct another head count to verify their crew is all present.
2. Each organization will then complete a head count, verify that all employees are accounted for and report the results to the PSM.
3. If a complete site evacuation is determined to be required by the PSM, each organization will have their employees proceed to a secondary assembly point to be designated by the PSM. The evacuation route from the WSM is to exit out of the parking lot and follow the access road to West River Road. Once personnel have gathered at the secondary assembly point, a second head count will be conducted and the results provided to the PSM.

When the WSM alarm system is activated, no additional entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the WSM will cease to allow safe exit of personnel and movement of emergency equipment. The PSM will notify all river contractors of the emergency situation and contractors will instruct vessel captains how to proceed. The site will not be re-entered until the PSM gives clearance to do so.

Re-start of work at the WSM will be made only after the PSM gives clearance.

10.5.2.2 River Vessel Evacuation

If an emergency occurs on a vessel, the following procedures will be implemented. The captain of the vessel will notify the contractor manager immediately of the situation either by radio or use of the Vessel Tracking System. The contractor manager is to notify the PSM or his or her designee. The captain of the vessel will evaluate the situation and determine if the Emergency Evacuation Plan for the vessel is to be implemented.

- The Captain will call for assistance to evacuate the crew from the vessel.
- Neighboring vessels will assist in the evacuation as directed by the Vessel Tracking System managers.
- Man Overboard may be called by the captain if the situation warrants it.
- Crew members evacuated will have a headcount conducted by the Captain of the vessel after all members have left the vessel in distress and have been assembled.
- The Captain will notify the contractor manager at the completion of the headcount.
- The contractor will provide this information to the on-river emergency coordinator.

Restart of work at or on the river will be made only after the PSM gives clearance.

Drills will be held periodically to practice all of the above procedures and will be treated with the same seriousness as an actual emergency.

SECTION 11

AUDITS AND CORRECTIVE ACTION

11.1 FORMAL SITE AUDIT

The field audit protocol is designed to identify and correct unsafe behaviors, acts, or conditions in each contractor's scope of work. The CM will conduct site audits regularly. Items found to be out of compliance must be assigned corrective action and the corrective action tracked to completion. The PSM maintains the original audit documentation on file. Contractors are required to complete their own weekly formal audit and submit a copy to the CM.

11.2 DAILY SITE WALK CHECKLIST

The CM's project personnel conduct a daily safety site walk to identify problem areas. Items found to be out of compliance must be assigned corrective action and the corrective action tracked to completion. Contractors are required to document their daily checklist inspection and submit to the CM.

11.3 ENFORCEMENT

CM and contractors enforce all applicable requirements of OSHA 1910 and 1926, New York State Department of Labor codes, rules and regulations and contract requirements. Contractor will have written progressive disciplinary systems available for review in the respective contractor HASP.

11.4 NOTICE OF VIOLATION

The project has a formal notice of violation (NOV) of safety and health regulations program to ensure that violations are issued in an imminent danger situation or when the contractor repeatedly fails to comply with safety and health requirements.

The NOV documents poor performance and requires a response from contractor senior management. The notice contains five distinct levels of discipline, from submission of a recovery plan to contract termination.

1. Contractor is notified of the violation and should take corrective action to prevent a reoccurrence. The corrective action shall be documented to the CM representative immediately.
2. Contractor must submit a plan for compliance to CM within two days of receipt of a formal letter. The compliance plan must include the means of compliance and the date that the requirements for compliance will be completed. Once compliance has been achieved, a follow-up letter must be sent to the CM.

3. Contractor is required to review the stated procedures with the CM. Work may not commence on the site until the review is complete and the contractor responds formally that the procedure is understood and will comply.
4. Contractor is required to review the stated procedures with CM. Work may not commence on the site until the review is complete, and contractor must confirm formally the disciplinary action to be taken against the supervisor and employees.
5. All work on the site will stop until the CM reviews all the facts with the subcontractor and determines whether the contract between the parties will be terminated.

SECTION 12

REFERENCES

NIOSH, OSHA, USCG, and USEPA. 1985. *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*. 86116.

NYSDEC. 1996. *Technical Field Guidance: Spill Reporting and Initial Notification Requirements*. May 1, 1996.

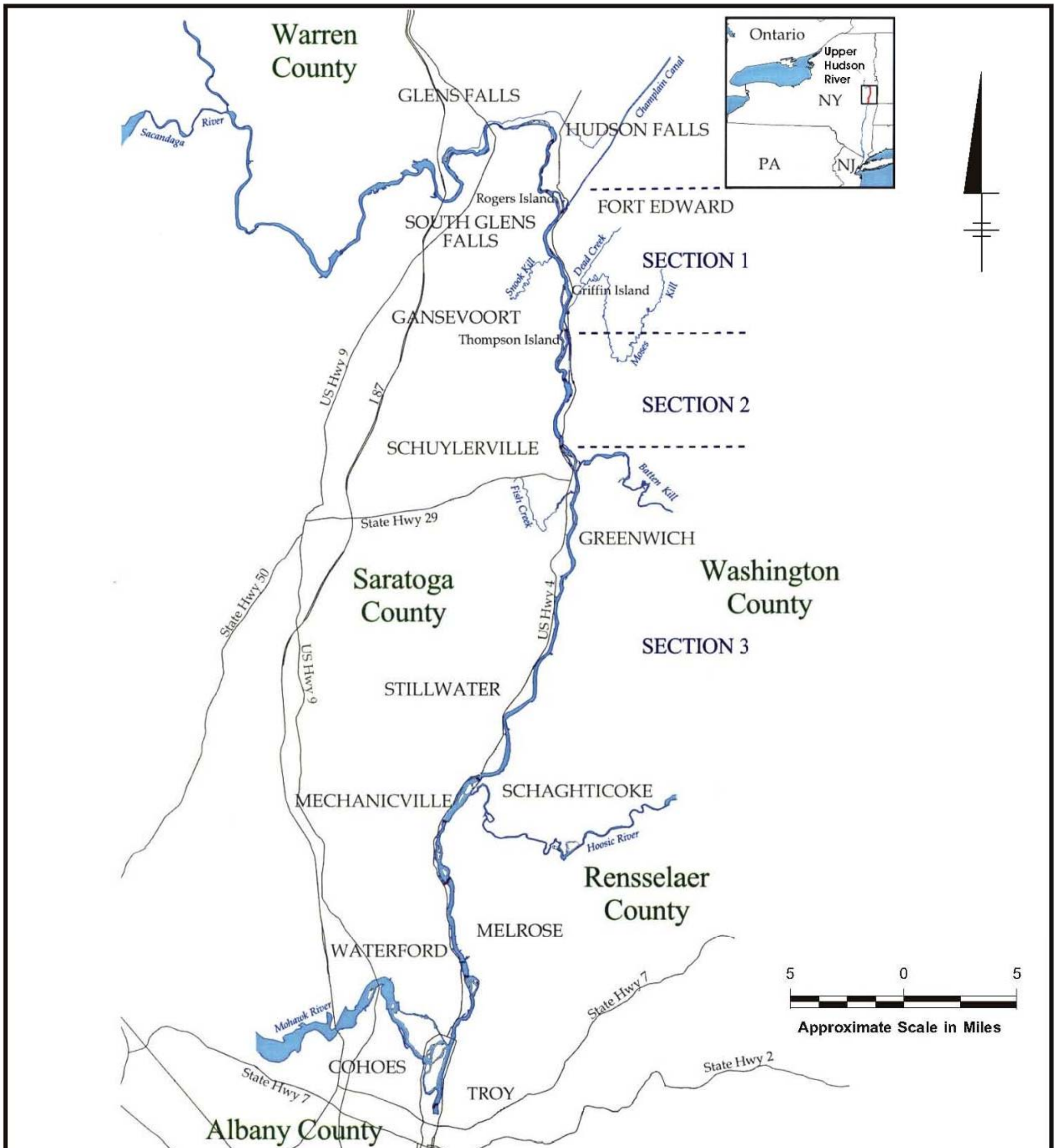
Parsons. 2011. *Phase 2 Remedial Action Community Health and Safety Plan for 2011 - Hudson River PCBs Superfund Site* (2011 CHASP). Prepared for General Electric Company, Albany, NY. Revision 1, April.

Parsons. 2011a. *Remedial Action Work Plan for Phase 2 Dredging and Facility Operations in 2011 - Hudson River PCBs Superfund Site*. Prepared for General Electric Company, Albany, N.Y. Revision 1, April.

US EPA/GE. 2002. Administrative Order on Consent for Hudson River Sediment Sampling (Index No. CERCLA-02-2002-2023) (Sediment Sampling AOC). Effective Date July 26, 2002.

US EPA/GE. 2005. Consent Decree in *United States v. General Electric Company*, Civil Action No. 1:05-cv-1270, lodged in United States District Court for the Northern District of New York, October 6, 2005. Final judgment entered November 2, 2006.

FIGURES



NOTE:
1. All locations are approximate.
2. Adapted from USEPA Feasibility Study (December 2000)

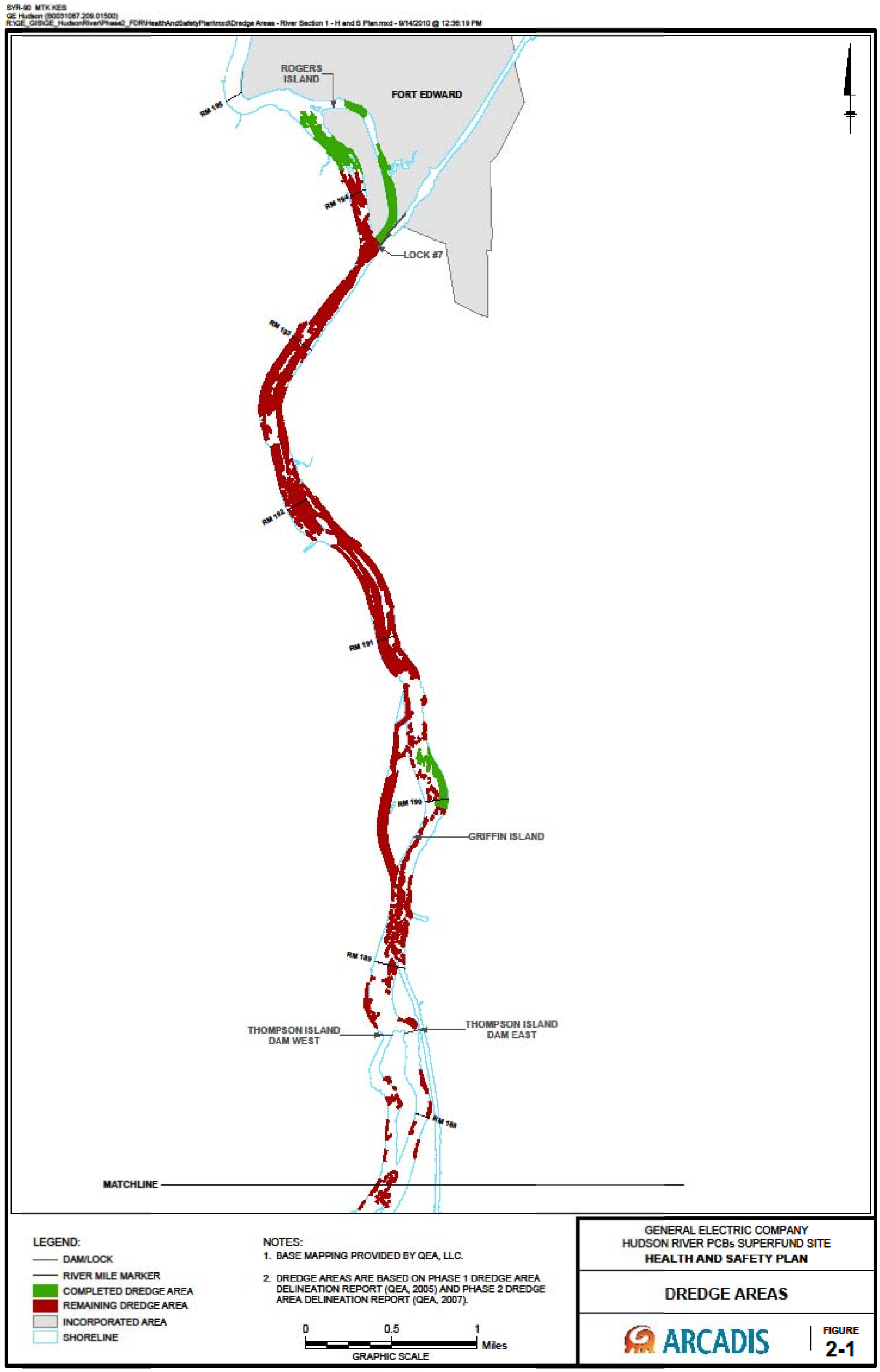
02/15/06 SYR-D85-KLS-DJH
C:20435700/CDR/20435N01.cdr

GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBS SUPERFUND SITE
REMEDIAL ACTION
HEALTH AND SAFETY PLAN

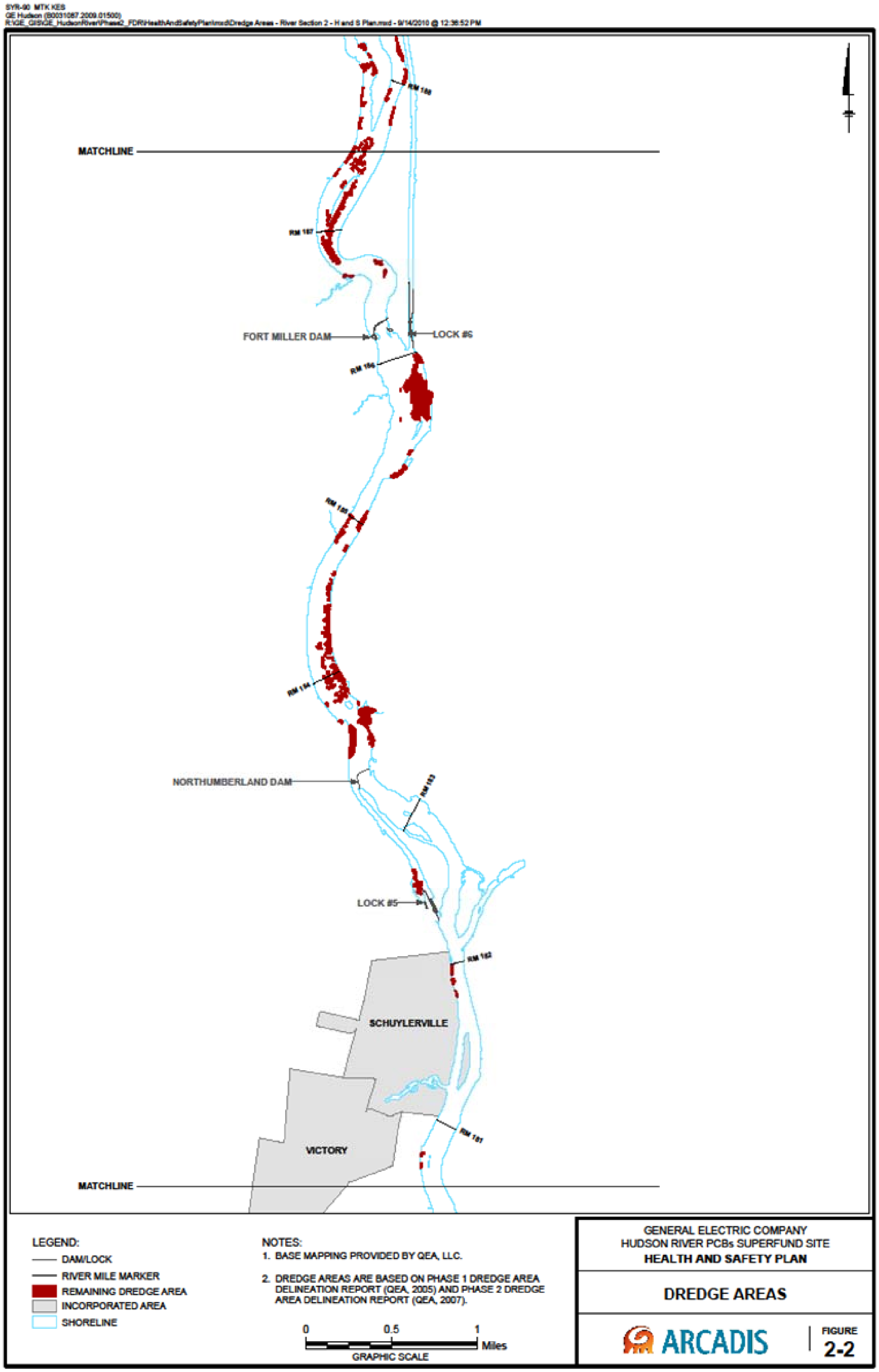
UPPER HUDSON RIVER

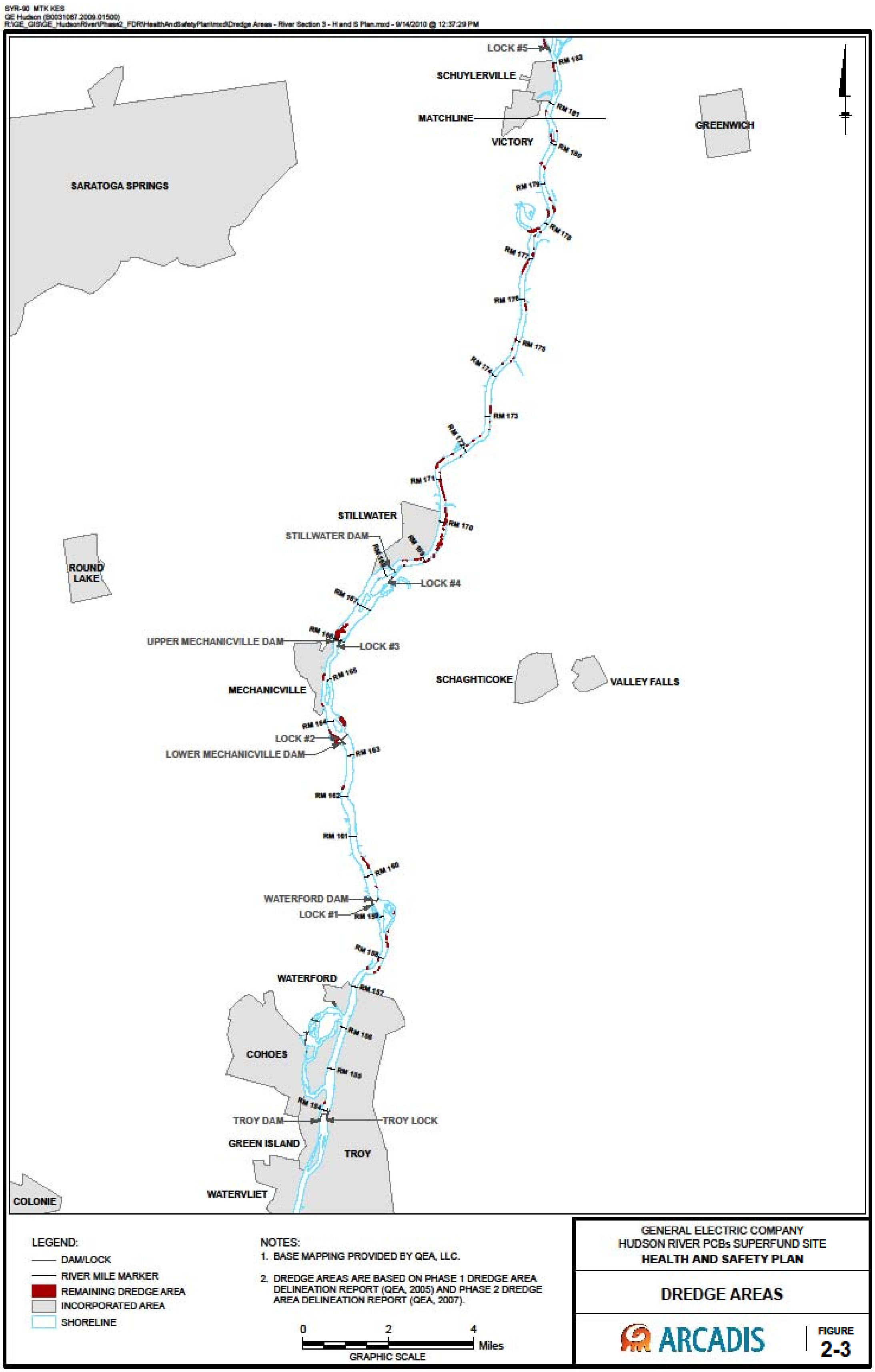
BBL
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

FIGURE
1



SYR-90 MTK KES
GE Hudson (B0031087.209.01500)
R:\GE_GIS\GE_HudsonRiver\Phase2_FDR\HealthAndSafetyPlan\mxd\Dredge Areas - River Section 1 - H and S Plan.mxd - 9/14/2010 @ 12:36:19 PM
ROGERS ISLAND
FORT EDWARD
RM 195
RM 194
LOCK #7
RM 193
RM 192
RM 191
RM 190
GRIFFIN ISLAND
RM 189
THOMPSON ISLAND DAM WEST
THOMPSON ISLAND DAM EAST
RM 188
MATCHLINE
LEGEND:
DAM/LOCK
RIVER MILE MARKER
COMPLETED DREDGE AREA
REMAINING DREDGE AREA
INCORPORATED AREA
SHORELINE
NOTES:
1. BASE MAPPING PROVIDED BY QEA, LLC.
2. DREDGE AREAS ARE BASED ON PHASE 1 DREDGE AREA DELINEATION REPORT (QEA, 2005) AND PHASE 2 DREDGE AREA DELINEATION REPORT (QEA, 2007).
0 0.5 1 Miles
GRAPHIC SCALE
GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE
HEALTH AND SAFETY PLAN
DREDGE AREAS
ARCADIS
FIGURE 2-1


SYR-90 MTK KES
GE Hudson (B0031087.2009.01500)
R:\GE_GIS\GE_HudsonRiver\Phase2_FDR\HealthAndSafetyPlan\mxd\Dredge Areas - River Section 2 - H and S Plan.mxd - 9/14/2010 @ 12:38:52 PM
RM 188
MATCHLINE
RM 187
FORT MILLER DAM
LOCK #6
RM 186
RM 185
RM 184
NORTHUMBERLAND DAM
RM 183
LOCK #5
RM 182
SCHUYLERVILLE
VICTORY
RM 181
MATCHLINE
LEGEND:
DAM/LOCK
RIVER MILE MARKER
REMAINING DREDGE AREA
INCORPORATED AREA
SHORELINE
NOTES:
1. BASE MAPPING PROVIDED BY QEA, LLC.
2. DREDGE AREAS ARE BASED ON PHASE 1 DREDGE AREA DELINEATION REPORT (QEA, 2005) AND PHASE 2 DREDGE AREA DELINEATION REPORT (QEA, 2007).
0
0.5
1
Miles
GRAPHIC SCALE
GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE
HEALTH AND SAFETY PLAN
DREDGE AREAS
ARCADIS
FIGURE
2-2


LOCK #5
SCHUYLERVILLE
MATCHLINE
VICTORY
GREENWICH
SARATOGA SPRINGS
RM 182
RM 181
RM 180
RM 179
RM 178
RM 177
RM 176
RM 175
RM 174
RM 173
RM 172
RM 171
STILLWATER
STILLWATER DAM
RM 170
ROUND LAKE
LOCK #4
RM 167
UPPER MECHANICVILLE DAM
LOCK #3
RM 166
RM 165
MECHANICVILLE
SCHAGHTICOKE
VALLEY FALLS
RM 164
LOCK #2
LOWER MECHANICVILLE DAM
RM 163
RM 162
RM 161
RM 160
WATERFORD DAM
LOCK #1
RM 159
RM 158
WATERFORD
RM 157
RM 156
COHOES
RM 155
RM 154
TROY DAM
TROY LOCK
GREEN ISLAND
TROY
WATERVLIET
COLONIE
LEGEND:
DAM/LOCK
RIVER MILE MARKER
REMAINING DREDGE AREA
INCORPORATED AREA
SHORELINE
NOTES:
1. BASE MAPPING PROVIDED BY QEA, LLC.
2. DREDGE AREAS ARE BASED ON PHASE 1 DREDGE AREA DELINEATION REPORT (QEA, 2005) AND PHASE 2 DREDGE AREA DELINEATION REPORT (QEA, 2007).
0
2
4
Miles
GRAPHIC SCALE
GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE
HEALTH AND SAFETY PLAN
DREDGE AREAS
ARCADIS
FIGURE
2-3

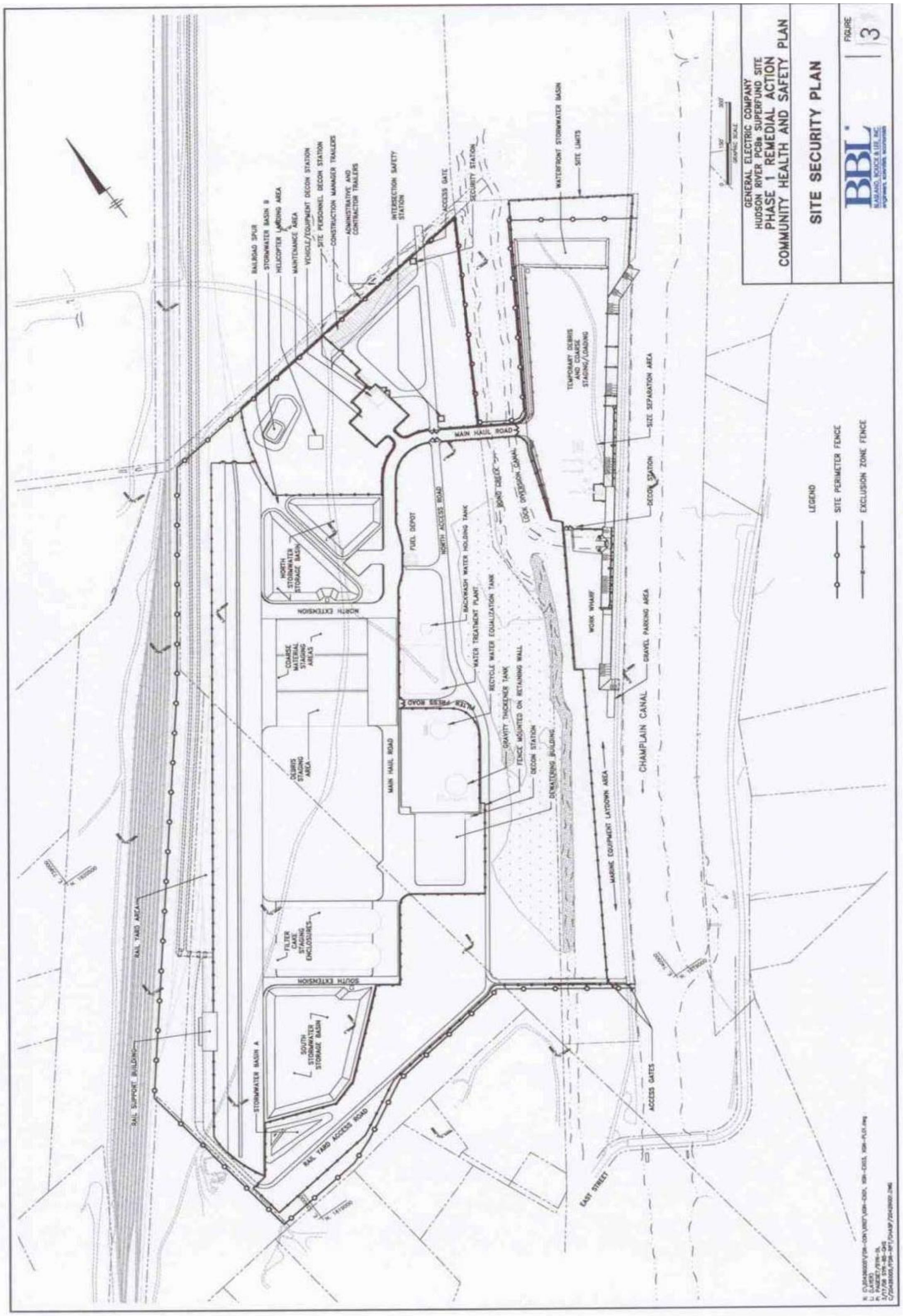


FIGURE 3
PROCESSING FACILITY

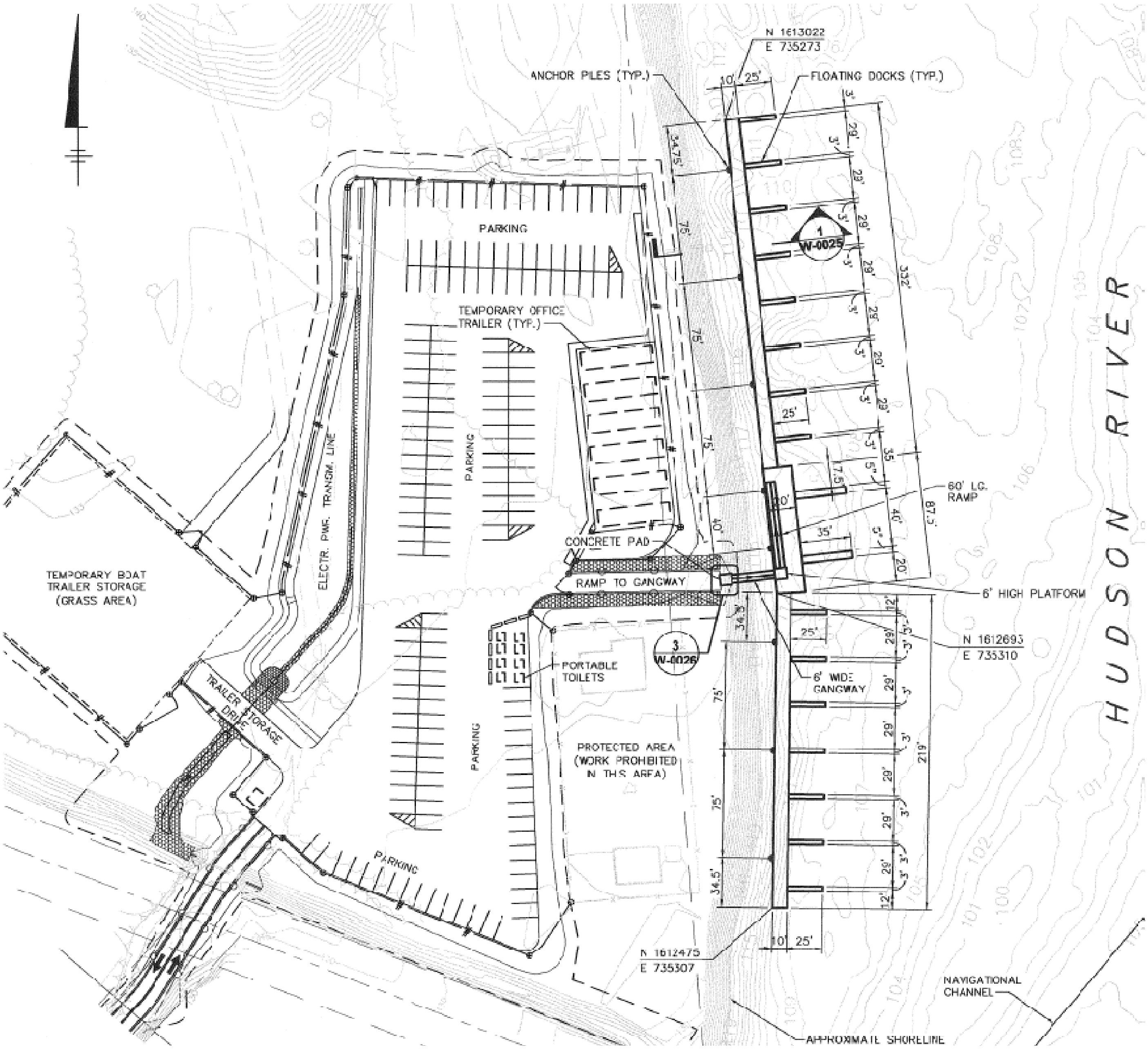


FIGURE 4
WORK SUPPORT MARINA

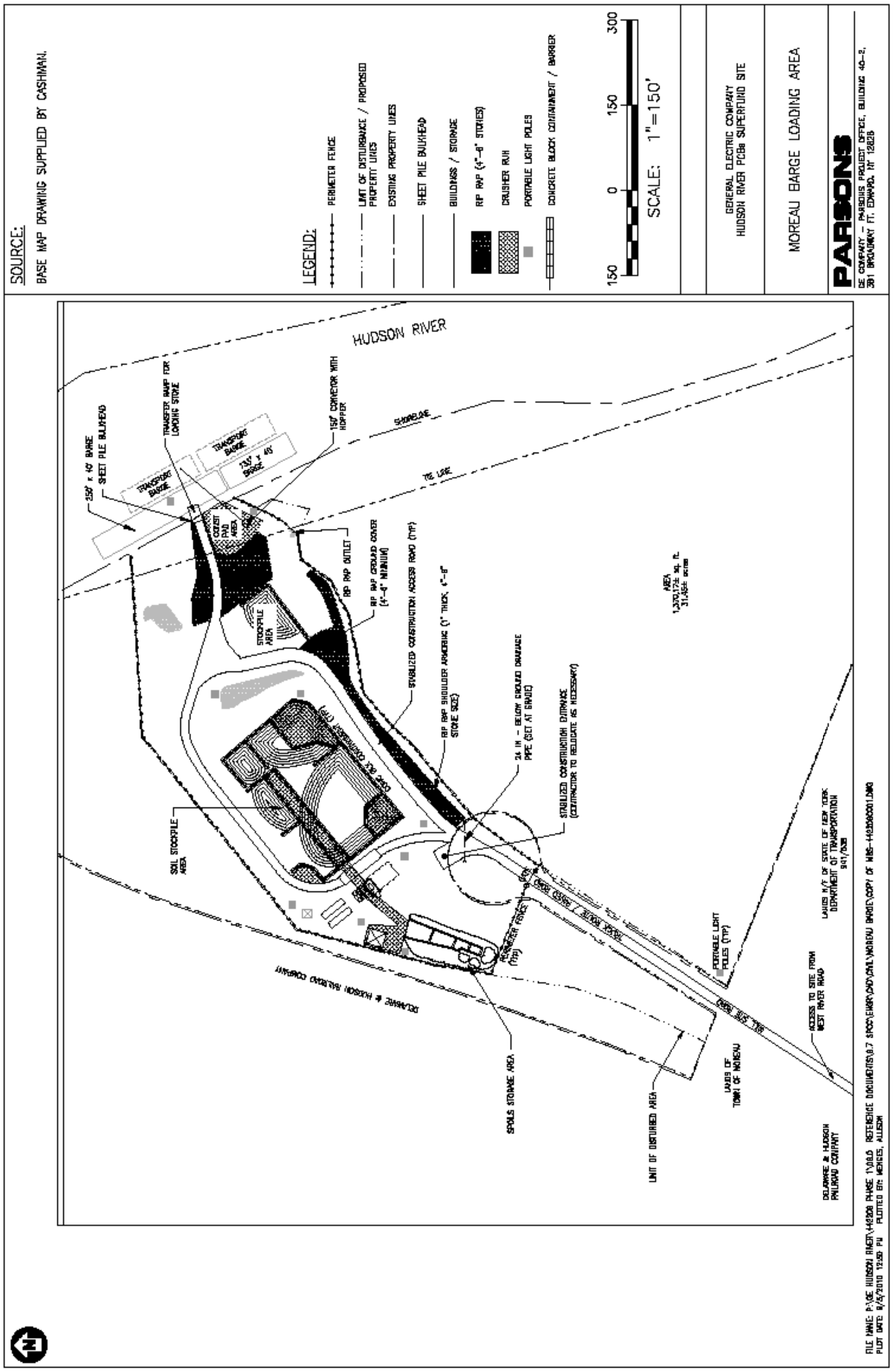


FIGURE 5
BACKFILL/CAP SUPPORT PROPERTY

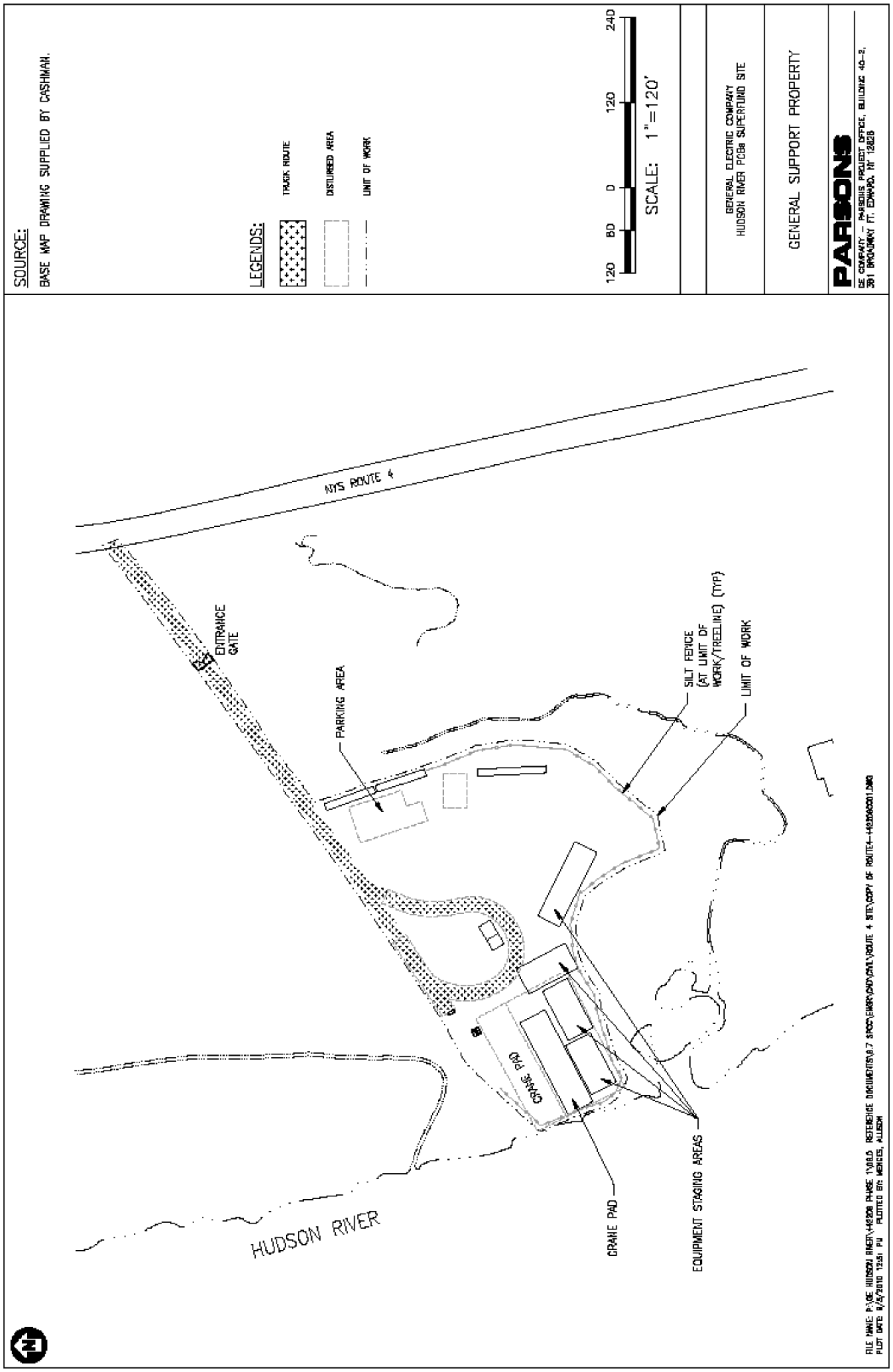


FIGURE 6
ROUTE 4 GENERAL SUPPORT PROPERTY

Directions to Glens Falls Hospital

FIGURE 7 – DIRECTIONS TO GLENS FALLS HOSPITAL

DIRECTIONS FROM THE SEDIMENT PROCESSING AND DEWATERING FACILITY

1. From **ACCESS ROAD**, turn **L** onto **ROUTE 196** - go a few miles,
2. Turn **R** on **MAIN STREET [US-4]** - go **0.1 mi**
3. Bear **L** to follow **US-4 NORTH** - go **0.1 mi**
4. Continue of **PARK PL** – go **0.1 mile**
5. Bear **R** on **RIVER STREET (RTE 254)** - go **0.7 mi**
6. Continue to follow **RTE 254** – go **0.6 mi**
7. **RTE 254** becomes **LOW WARREN STREET** - go **0.6 mi**
8. **LOWER WARREN STREET** becomes **WARREN STREET (RT-32) -** go **1.3 mi**
9. Bear **L** on **HUDSON AVE** - go **0.2 mi**
10. Turn **L** on **SCHOOL STREET** - go **0.1 mi**
11. Turn **R** on **PARK STREET -** go **0.1 mi**
12. Arrive at **HOSPITAL - 100 PARK STREET**, **GLENS FALLS** on **L**

DIRECTIONS FROM THE WEST RIVER ROAD BACKFILL/CAP SUPPORT PROPERTY AND/OR THE WORK SUPPORT MARINA

1. Start at **BACKFILL/CAP AREA OR THE WORK SUPPORT MARINA**,
2. Turn **R** on **W RIVER RD** – go **to end**

3. Turn **R** on **Reynolds RD [RT-197]** – go **0.1 mi**
4. Turn **L** on **FORT EDWARD RD** – go **3.0 mi**
5. Continue to follow **CR-28** – go **0.8 mi**
6. Continue on **MAIN ST [US9**] – go **0.5 mi**
7. Continue to follow **US-9** – go **0.3 mi**
8. Turn **L** on **PARK ST** – go **0.2 mi**
9. Arrive at **HOSPITAL - 100 PARK STREET**, **GLENS FALLS** on the **L**

DIRECTIONS FROM THE ROUTE 4 GENERAL SUPPORT PROPERTY

10. Start at **BACKFILL/CAP AREA OR THE WORK SUPPORT MARINA**,
11. Turn **L** on **ROUTE 4** – go 1 **mi**
12. Turn **L** on **Reynolds RD [RT-197]** – go **1/2 mi**
13. Turn **R** on **FORT EDWARD RD** – go **3.0 mi**
14. Continue to follow **CR-28** – go **0.8 mi**
15. Continue on **MAIN ST [US9**] – go **0.5 mi**
16. Continue to follow **US-9** – go **0.3 mi**
17. Turn **L** on **PARK ST** – go **0.2 mi**
18. Arrive at **HOSPITAL - 100 PARK STREET**, **GLENS FALLS** on **L**

ATTACHMENT A

EMERGENCY AND SITE SAFETY PERSONNEL CONTACT INFORMATION

EMERGENCY CONTACT INFORMATION
(in Alphabetical Order)

EMERGENCY CONTACT INFORMATION

Emergency Contact	Contact Name	Emergency No.	Alternate No.
Canadian Pacific Railway Police Communication Ctr.	N/A	800-716-9132 Dial 1	518-383-7200 Press (1) for Railway Police
Ft. Edward Police Department	Chief of Police Walter Sandford	911	518-747-6365 Station 518-747-2782 Cell
Ft. Edward Rescue Squad	Tom Bover	911	518-747-6198 Squad 518-361-5361Cell
Ft. Edward Fire Department	Chief, Matt Hurlburt	911	518-747-8309 Station 518-796-6735 Cell 518-7796-6735 Home
Gansevoort Fire Department	Chief, Kurt Haas	911	518-792-4396 Squad 518-488-1265 Cell 518-683-5111 Home
Kingsbury Fire Department	Chief, James Brunnelle	911	518- 955-0377 -Cell 518-747-4990 Fire House
Moreau Emergency Squad	Chief, Andre Delvaux	911	518-793-3011 Station 518-791-2306 Cell
National Response Center and Terrorist Hotline	N/A	800-424-8802	N/A
New York State Canal Corporation	Canal Corporation / Thruway Dispatcher	N/A	518-436-2822, or 800-635-8556 This would be the only emergency phone.
New York State Department of Environmental Conservation	Hudson River Project Manager, Kevin Farrar	N/A	518-402-9778 Office 518-810-6838 Cell
New York State Department of Environmental Conservation	William Daigle, Hudson River Unit, Division of Environmental Remediation	N/A	518-402-9770
New York State Department of Health (Glens Falls)	Anita Gabalski, Director	N/A	518-793-3893 866-881-2809 Emergency
New York State Department of Health	Deanna Ripstein, Project Manager After-hours Duty Officer	N/A	518-402-7860 866-881-2809
New York State Department of Health (Glens Falls)	Kristine Wheeler	518-542-5782	518-793-3893
New York State Police	Troop "G" Headquarters	N/A	518-783-321Office 518-477-9333 Emergency Dispatch

EMERGENCY CONTACT INFORMATION

Emergency Contact	Contact Name	Emergency No.	Alternate No.
New York State Police	Troop "T" Headquarters	N/A	518-436-2825 Local 518-433-4924 Dispatch 800-842-2233 Emergency Dispatch
New York State Spill Response Program	Janet Crawford, Coordinator Spill Hotline 24 hour	N/A	800-457-7362
Poison Control Center	N/A	800-222-1222	N/A
Saratoga County HAZMAT	Mike Aufiero	911	518-885-2232 Office 518-885-5415 Home
Saratoga County Office of Emergency Services	Director Paul Lent	N/A	518-885-2232 Station
Saratoga County Sheriff	James Bowen, Sheriff	911	518-885-2450 518-885-6761 Dept
South Glen Falls Fire Company	Chief Peter Corlew	911	518-792-1674 Station 1 518-798-4020 Station 2 518-361-2656 Cell
South Glens Falls Police	Chief, Kevin Judd	911	518-792-6336 Station 518-792-4173 Dispatch
U.S. Coast Guard (Station Burlington, VT)	N/A	911	802-864-6791 Emergency 802-951-6792 Station
U.S. Environmental Protection Agency	Hudson Falls Field Office Director, David King	N/A	518-747-4389 Office 518-321-7239 Cell
U.S. Environmental Protection Agency	Hudson River Team Leader, Doug Garbarini	N/A	212-637-4288
Warren County Sheriff	Nathan "Bud" York, Sheriff	911	518-743-2500 Office
Washington County Department of Public Safety	Director, William Cook	911	518-747-7520 Dispatch 518-796-1749 Cell 518-747-0472 Home
Washington County Sheriff	Undersheriff, Matthew Mabb	911	518-746-2475 Station 518-744-5139 Cell 518-747-0126 Home

CONSTRUCTION MANAGER CONTACT INFORMATION

Project Personnel	Name/Contact	Telephone Numbers
Project Construction Manager	Larry Hartman	303-668-3170
Project Safety Manager	PD Frey	518-470-7067
Processing Facility Site Manager	Mark Murphy	518-232-0493
Processing Facility Safety Representative	Joe Montinieri, CSP	518-361-7597
River Operations Manager	Carl Jakob	518-705-3145
Dredging Safety Representative	Joe Gallivan	518-365-4520
Other Project Safety Representative	Chris Boehm	518-528-3116
Contractor PM/Safety Representatives:	**K30 –Processing Facility Operations** Sid Archinal – Project Director John Waechter - PM James Bolden – SSO	 609-588-6305 518-378-3679 865-548-7870
	K40 – Dredging Operations Norm Bourque - PM Stu Chandler - SSO **K50 – Habitat Construction** (Contractor TBD)	 617-584-0444 781-413-7510
	K60 - Rail Yard Operations Steve Fisk – PM Paul Watson **Arcadis** J. Paul Doody, PE – PM Doug Weeks – SSO **Anchor QEA, LLC** Mark LaRue – PM Kevin Ballou – SSO	 518-469-4145 518-495-9151 315-671-9237 518-452-7826 x11 315-453-9009 518-792-3709

Notes
CSP = Certified Safety Professional
PM = Project Manager
SSO = Site Safety Officer

ATTACHMENT B

HEALTH AND SAFETY PLAN ACKNOWLEDGMENT

ATTACHMENT B

Site-Specific Health and Safety Plan (HASP) Acknowledgement

I hereby confirm that site-specific health and safety training has been conducted by the site health and safety officer, which included:

- Names of personnel responsible for site safety and health
- Safety, health, and other hazards at the site
- Proper use of personal protective equipment
- Work practices by which the employee can minimize risk from hazards
- Safe use of engineering controls and equipment on the site
- Acute effects of compounds at the site
- Decontamination procedures

For the following project:

(Project Title)	(Project Number)	(City, State)

Name (print)	Signature	Company	Date

ATTACHMENT C

SAFETY TOOLBOX MEETING LOG

2011 RA HEALTH AND SAFETY PLAN

Safety Meeting Presenter: ______________________________Date: _________________

Current Weather Conditions:

Temperature (^{o}F) = _____ Wind Direction = _______ Wind Speed = _________

Clear - Sunny – Cloudy – Rain - Snow Forecast = ____________________________________

Current Site Conditions (circle as appropriate):

Dry - Wet - Muddy - Frozen - Snow Covered - Other (describe) ____________________________

1. Near-Miss, Incidents or Injuries to report from Previous Day Activities: No ☐ Yes ☐ - explain below:

____

2. Safe and/or At-Risk Observations from Previous Day Activities: _________________________

____

____

3. Activities Taking Place Today: ____

____

____

4. Anticipated Hazards: ____

____

____

5. Engineering Controls-Work Practices-PPE to Protect Against Hazards: _____________________

____

____

6. Additional Safety Topic or Comments: ____

____

____

2011 RA HEALTH AND SAFETY PLAN

PRINTED NAME	SIGNATURE	COMPANY	LAST 4 DIGITS OF SS #

ATTACHMENT D

HOT WORK PERMIT

Attachment D

Hot Work Permit

This permit becomes void:

(1) At the end of the shift or
(2) Whenever conditions change significantly or
(3) On any emergency signal.

PERMIT NO. ___________________

DATE:____ SHIFT:________________________

BUILDING: ______________________________________ AREA:________________________

NATURE OF WORK: ____

____

SPECIAL PRECAUTIONS:____

____

IS FIRE WATCH REQUIRED?: ____

ADDITIONAL PERMIT REQUIRED?: e.g., confined space ______________________________

STEP 2 (See reverse side for Step 1)

The location where this work is to be done has been examined, necessary precautions taken, and permission is granted for this work. (See other side)

Permit expires:_____________________________ Signed: _________________________________
(SSHO)

Time started: ______________________________________ Completed: ____________________

STEP 3
FINAL CHECKUP

Work area and all adjacent areas to which sparks and heat might have spread (including floors above and below and on opposite sides of walls) were inspected 60 minutes after the work was completed, a fire watch or designee continued monitoring for an additional three hours and when the four hour monitoring is completed, the fire safety supervisor inspects the area once more and were found firesafe.

Signed:___________________________________
(Supervisor or Fire Watcher)

ATTENTION

STEP 1

Before approving and cutting and welding permit, the supervisor shall inspect the work area and confirm that precautions have been taken to prevent fire in accordance with this manual.

PRECAUTIONS

- ☐ Sprinklers in service
- ☐ Cutting and welding equipment in good repair
- ☐ Personnel protective equipment available and in good condition

WITHIN 35 FT OF WORK

- ☐ Floors swept clean of combustibles
- ☐ Combustible floors wet down, covered with damp sand, metal or other shields
- ☐ No combustible material or flammable liquids
- ☐ Combustibles and flammable liquids protected with covers, guards or metal shields
- ☐ All wall and floor openings covered
- ☐ Covers suspended beneath work to collect sparks

WORK ON WALLS OR CEILINGS

- ☐ Construction noncombustible and without combustible covering
- ☐ Combustible moved away from opposite side of wall

WORK ON ENCLOSED EQUIPMENT
(Tanks, containers, ducts, dust collectors, etc.)

- ☐ Equipment cleaned of all combustibles
- ☐ Containers purged of flammable vapors

FIRE WATCH

- ☐ To be provided during and 60 minutes after operation
- ☐ Supplied with extinguisher and small hose
- ☐ Trained in use of equipment and in sounding fire alarm
- ☐ Has necessary personnel protective equipment
- ☐ Fire watch or designee must continue monitoring for an additional three hours.

FINAL CHECKUP

- ☐ When four hour monitoring is completed, the fire safety supervisor inspects the area once more..

Signed:____________________________________
(Supervisor)

ATTACHMENT E

CONFINED SPACE ENTRY PERMIT

Attachment E

CONFINED SPACE ENTRY PERMIT

ANY CHANGE IN THE CONFINED SPACES ENVIRONMENT, OR A LACK OF OCCUPANCY, SHALL REQUIRED NEW MONITORING PRIOR TO THE RE-COMMENCEMENT OF WORK.

SPACE TO BE ENTERED ______________________

PURPOSE OF THE ENTRY ______________________

DATE PERMIT ISSUED ______________________

AUTHORIZED DURATION OF PERMIT ______________________

PRINT NAME OF ENTRY SUPERVISOR ______________________

SPACE HAZARDS	YES	NO		YES	NO
ATMOSPHERIC			FALLS FROM HEIGHT		
MECHANICAL			HEAT		
ELECTRICAL			ADJACENT WORK		
CHEMICAL			WORK BEING PERFORMED		
ENGULFMENT			CONFIGURATION		
NOISE			OTHER		

HAZARD CONTROLS	YES	NO		YES	NO
LOTO			CLEANING AND PURGING		
BLANKING OR HAZARD ELIMINATION			ADDITIONAL WORK PERMITS		
NATURAL VENTILATION			CONTINUOUS AIR MONITORING		
MECHANICAL VENTILATION			OTHER		

EQUIPMENT NEEDED	YES	NO		YES	NO
GLOVES			AIR MONITOR		
PROTECTIVE CLOTHING			AIR BLOWER		
SAFETY SHOES/BOOTS			FLOOD LIGHTS / FLASHLIGHTS		
HARD HAT			RADIOS / CELL PHONE		
SAFETY GLASSES/GOGGLES/ FACE SHIELD			GFCI		
LADDER			EYE WASH/SHOWER ACCESS		
FIRE EXTINGUISHER			OTHER		
FIRE BLANKETS/SHIELD			OTHER		

ATMOSPHERIC TESTING

MONITORING EQUIPMENT USED ______________________

MONITOR CALIBRATION DATE ______________________

PERSON PERFORMING TESTS (PRINT NAME) ______________________

PERSON PERFORMING TEST (SIGNATURE) ______________________

	SAFE OPER. LIMIT	TESTING TIME / RESULTS	TESTING TIME / RESULTS
OXYGEN (O2)	19.5 - 23.5%		
LOWER FLAMMABILITY LIMIT	< 10%		
CARBON MONOXIDE	< 25 PPM		
OTHER			

ENTRY PERSONNEL

NAME(S) OF ENTRANTS	CS TRAINING DATE	NAME(S) OF ATTENDANTS	CS TRAINING DATE

ALTERNATE ENTRY PROCEDURE

ALL INFORMATION REQUIRED ABOVE THIS SECTION MUST BE COMPLETED BEFORE REVIEWING A PERMIT SPACE FOR THE ALTERNATE ENTRY.

DOES SPACE ONLY HAVE ATMOSPHERIC HAZARDS?	YES	NO	If YES, CONTINUE TO NEXT QUESTION. IF NO, MOVE TO RECLASSIFICATION PROCEDURE
IS CONTINUOUS FORCE AIR VENTILATION ADEQUATE?	YES	NO	IF YES, CONTINUE TO NEXT QUESTION. IF NO, MOVE TO PERMIT SPACE PROCEDURE.
IS AIR SUPPLY FOR VENTILATION FROM A CLEAN SOURCE?	YES	NO	IF YES, CONTINUE TO NEXT QUESTION. IF NO, MOVE TO PERMIT SPACE PROCEDURE.
CAN TESTING BE CONDUCTED FROM OUTSIDE THE SPACE?	YES	NO	IF YES, CONTINUE TO NEXT QUESTION. IF NO, MOVE TO PERMIT SPACE PROCEDURE.
HAS TESTING CONFIRMED HAZARD IS CONTROLLED?	YES	NO	If YES, CONTINUE TO NEXT QUESTION. IF NO, MOVE TO RECLASSIFICATION PROCEDURE
WILL PERIODIC ATMOSPHERIC TESTING OCCUR?	YES	NO	IF YES, ENTRY SUPERVISOR SIGNS AND WORK BEGINS, IF NO MOVE TO PERMIT SPACE PROCEDURE

BY SIGNING BELOW, I UNDERSTAND THE REQUIREMENTS FOR AN ALTERNATE ENTRY AND HAVE VERIFIED THEY HAVE BEEN ACHIEVED. I ALSO UNDERSTAND THAT NO ATTENDANT OR OTHER CONTROLS ARE REQUIRED FOR THIS SPACE AND ALL INFORMATION ON THIS ENTRY PERMIT HAS BEEN REVIEWED WITH THE ENTRANT(S).

SIGNATURE OF ENTRY SUPERVISOR: ______________________

IF ALTERNATE ENTRY PROCEDURE USED, STOP FILLING OUT ENTRY PERMIT HERE

RECLASSIFICATION PROCEDURE

ALL INFORMATION REQUIRED ABOVE THIS SECTION MUST BE COMPLETED BEFORE REVIEWING A PERMIT SPACE FOR RE-CLASSIFICATION

CAN HAZARDS BE ELIMINATED FROM OUTSIDE THE SPACE?	YES	NO	IF YES, CONTINUE TO NEXT QUESTION. IF NO, MOVE TO PERMIT SPACE PROCEDURE
HAVE ALL HAZARDS BEEN ELIMINATED?	YES	NO	IF YES, CONTINUE TO NEXT QUESTION. IF NO, MOVE TO PERMIT SPACE PROCEDURE
FORCED AIR VENTILATION IS NOT NEEDED?	YES	NO	IF YES, ENTRY SUPERVISOR SIGNS BELOW AND WORK BEGINS. IF NO, MOVE TO PERMIT SPACE PROC.

BY SIGNING BELOW, I UNDERSTAND THE REQUIREMENTS FOR A RECLASSIFICATION OF A PERMIT SPACE AND HAVE VERIFIED THEY HAVE BEEN ACHIEVED. I ALSO UNDERSTAND THAT NO ATTENDANT OR OTHER CONTROLS ARE REQUIRED FOR THIS SPACE AND ALL INFORMATION LISTED ON THIS ENTRY PERMIT HAS BEEN REVIEWED WITH THE ENTRANT(S).

SIGNATURE OF ENTRY SUPERVISOR: ______________________________

IF RECLASSIFICATION PROCEDURE USED, STOP FILLING OUT ENTRY PERMIT HERE

PERMIT SPACE PROCEDURE

ALL INFORMATION REQUIRED ABOVE THIS SECTION MUST BE COMPLETED PRIOR TO COMPLETING PERMIT SPACE PROCEDURES

SPACE HAZARDS COULD RESULT IN A?	YES	NO		YES	NO
FALL			DISABLING INJURY THAT COULD PREVENT SELF RESCUE		
AMPUTATION			PERMANENTLY DISABLING INJURY		
SUFFOCATION/ASPHYXIATION			DEATH		
ELECTROCUTION					
IF YOU ANSWER YES TO ANY OF THESE THEN 4 MINUTE RESCUE RESPONSE IS REQUIRED					

RESCUE PREPARATIONS	YES	NO		YES	NO
OUTSIDE RESPONSE PROVIDER			RESCUE ON STAND-BY		
RESCUE TEAM ON SITE					

RESCUE EQUIPMENT	YES	NO		YES	NO
LIFELINE			FIRE EXTINGUISHER		
FULL BODY HARNESS			ESCAPE RESPIRATOR		
ANKLETS			CARTRIDGE RESPIRATOR		
WRISTLETS			AIR SUPPLIED RESPIRATOR		
WINCH			SCBA		
TRIPOD			OTHER		
RADIOS / CELL PHONE			OTHER		

COMMUNICATION MEANS BETWEEN ENTRANT/ATTENDANT: ______________________________

EMERGENCY CONTACT NUMBER: ______________________________

IN THE EVENT OF AN EMERGENCY, ATTENDANT MUST:

____

____

PRE-ENTRY MEETING CONDUCTED? YES NO

WE HAVE REVIEWED THE WORK AUTHORIZED BY THIS PERMIT AND THE INFORMATION CONTAINED HERE-IN. ALL WRITTEN INSTRUCTIONS, SAFETY PROCEDURES AND EQUIPMENTS HAVE BEEN RECEIVED AND ARE UNDERSTOOD.

	SIGNATURE	DATE
ENTRY SUPERVISOR		
PERMIT ISSUER		
ENTRANT		
ENTRANT		
ATTENDANT		

THIS COMPLETED PERMIT MUST BE POSTED AT THE CONFINED SPACE AND AVAILABLE FOR REVIEW.

POST ENTRY VERIFICATION

THE ENTRY SUPERVISOR MUST REVIEW WORK SITE POST EVENT TO ENSURE EQUIPMENT IS BACK IN SAFE CONDITION AND ALL NEEDED EQUIPMENT/TOOLS HAVE BEEN ACCOUNTED FOR.

TIME ENTRY COMPLETED, AM/PM ______________________________

DATE ______________________________

SIGNATURE ENTRY SUPERVISOR

THIS COMPLETED PERMIT MUST BE KEPT ON FILE FOR 1 YEAR AND MUST BE READILY AVAILABLE FOR INSPECTION/REVIEW

PERMIT REVIEW ISSUES: ______________________________

ATTACHMENT F

INCIDENT/NEAR-MISS INVESTIGATION REPORT

Attachment F
INCIDENT/NEAR MISS INVESTIGATION REPORT

Investigation Date: ________________ Date of Incident: _____________ Time: ______AM/PM

Employee Name: ______________________________ Sex: M / F Trade/Craft: _____________

Supervisor Name: ____________________________________

Location of Incident: ____

Incident Classification:

Near Miss: _____ Personal Injury: _____ Property Damage: _____ Environmental Spill: _____

Medical Treatment: None ___ FA ___ Med. Treatment ____ Lost Time ____

Medical Treatment Facility: Address ____

City: ______________________________ State: _____ Zip: _______ Phone: _______________

Description (Provide facts, how incident occurred – step by step, in order)

Root Causes (List unsafe acts, conditions, personal or job factors, and management systems that contributed to the incident)

Corrective Actions (List at least one corrective action for each root cause item, the person(s) responsible and scheduled completion date(s)

Witness Name(s): _______________________________________ Attach Witness Statement(s)

Investigated by: ____ Date: ________________

Supervisor Review: ____ Date: ________________

Injury Information: Body Part: ____

Injury Type: ____

Attachments: Add information from the root causes and corrective actions such as:

Witness Statements

Diagram(s) of incident

Photo(s)

Fishbone diagram

5 Whys

Follow-Up: Ensures Corrective Actions are completed.

CLOSURE DATE: ____________ REVIEWED BY: ________________________

ATTACHMENT G

PRE-DRILLING/SUBSURFACE CHECKLIST FOR INTRUSIVE FIELDWORK

PREDRILLING/SUBSURFACE CHECKLIST FOR INTRUSIVE FIELDWORK

Site Name: ____________ Job Number: ____________
Site Phone Number: ____________
Site Address: ____________ County: ____________
Client Proj. Mgr.: ____________ Phone: ____________
Site Manager Contacted Date: ____________ By: ____________
Site Drawings (yes / no / NA) ______ (please attach) Historical Drawings (yes / no / NA) ______
Third Party Construction/Redevelopment Plans (Yes/No/NA)

***ATTACH SITE FIGURE WITH PROPOSED BORING LOCATIONS

Subcontractor's (drillers, concrete, etc...) Company ____________
Subcontractor's Contact Person ____________ Phone ____________
Meeting / Start Date ____________ Time ____________

1) Health and Safety Signoff Form Completed? (Yes/No) Date ____________

2) Utility Protection Services (Minimum 48 Hrs. Advance Notice, State Specific Notification Period Supercedes)
Called: Date ______ Time ______ Initials ______
Reference # ____________
Proposed Drilling Locations Premarked for Locating Service. Y / N

3) Private or In-House Utility Locating Service Performed? Y / N ______
Called: Date ______ Time ______ Initials ______
Name of Locating Service: ____________
Telephone #/ contact: ____________
Name of Supplier Locating Technician: ____________
Type of sensing equipment used: ____________
Proposed Drilling Locations Premarked Y / N

4) Other Potential Underground Structures
Name of City Engineer/Utility Representative: ____________
Telephone #: ____________
Date Notified ____________ Maps: Y / N
Cleared: Y / N

5) COMPLETED SITE WALKOVER W/ SITE MANAGER/DESIGNEE OR OWNER/TENANT REP. Y / N
Name of Site Manager: ____________
Name of Property Owner/Tenant Representative: ____________
Cleared: Yes / No
Building Utility Service Line Connections Identified: Y / N
(Hand sketch on site map w/proposed boring locations and most likely utility trench locations)

6) Utility Inventory: Y / N

Utility	Name	Depth (ft) (If Available)	Phone	Notified - Date		Marked
Above Ground Services						
Electric		NA		Y / N		Y / N
Telephone		NA		Y / N		Y / N
Cable		NA		Y / N		Y / N
Overhead Supports		NA		Y / N		Y / N
Traffic light cables		NA		Y / N		Y / N

PREDRILLING/SUBSURFACE CHECKLIST FOR INTRUSIVE FIELDWORK

6) Utility Inventory Continued:

Below Ground Services:

Electric				Y / N		Y / N
Telephone				Y / N		Y / N
Cable				Y / N		Y / N
Gas				Y / N		Y / N
Water				Y / N		Y / N
UST System				Y / N		Y / N
Storm				Y / N		Y / N
Sanitary				Y / N		Y / N
Steam				Y / N		Y / N
Pipeline Companies				Y / N		Y / N

Other:

				Y / N		Y / N
				Y / N		Y / N
				Y / N		Y / N

7) Site-Specific Emergency Contingency Plan Incorporated in Health & Safety Plan Y / N

8) Drilling Locations Approved by Client Project Manager Named Above? Y / N

9) Signature of Parsons' Project Mgr. (required to begin fieldwork):

Name of Project Manager

Signature of Project Manager

Name of Parsons Field Personnel

Signature of Field Personnel

(This document to be included with the site H&S Plan and should be available upon request.)

ADDITIONAL COMMENTS / NOTES:

ATTACHMENT H

WATER OPERATIONS PERMIT, FLOAT PLAN AND FIELD ACTIVITIES TRACKING STANDARD OPERATING PROCEDURE

GE HUDSON RIVER SEDIMENT REMEDIATION PROJECT
WATER OPERATIONS PERMIT

1. PERMIT AUTHORIZATION
(To Be Completed by Approver of Permit)

Permit valid from: ____________ to ____________
(Maximum of 1 Week Duration Unless Otherwise Approved)

Special Permit Restrictions Noted: ____________

Operations **Restricted** when river flows are greater than ________ cfs and/or visibility is less than ____ miles.

Must be docked and personnel **OFF** the water at the end of each day no later than: ____________

Is night work allowed: Yes ☐ No ☐

CM Health and Safety Representative: ____________ Date: ________

River Operations Manager and/or Designated Representative: ____________ Date: ________

2. GENERAL PERMIT INFORMATION
(To Be Completed by Applicant)

Applicant Name: ____________

Principal Contractor: ____________

Sub-Contractor *(if applicable)*: ____________

Purpose of Work: ____________

Geographic Work Limits: *(Include locations, CUs, chart references)*
[Provide land based launch/support location(s) as well]

____

Does work involve use of boats or vessels? Yes ☐ No ☐ shoreline work? Yes ☐ No ☐

Is the work within 3000' of any dams? Yes ☐ No ☐

Maximum river flow that work will be conducted to: ____________

Expected water temperature range during work period: ____________

Anticipated water depths in work area: ____________

Work Duration: ____________

Typical Work Hours: ____________

Contractor Site Safety Officer: ____________ Cell Phone: ____________

3. VESSEL AND OPERATOR INFORMATION
(To Be Completed by Applicant. If more than one vessel, attach additional forms to this document with additional vessel information)

Vessel Type: ________ Vessel Registration ________ Vessel Capacity ________

Is vessel equipped with GPS?: Yes ☐ No ☐ Is vessel equipped with AIS?: Yes ☐ No ☐ Other ☐

Maximum Number of Vessel Occupants Boat is rated for: ____________

Number and Horsepower of Vessel Engines ____________

Description of auxiliary propulsion: ____________

Description of ground tackle on board and effective maximum depth: ____________

____

Marine VHF Working Channel: ____________

Vessel Operator's Name: ____________ Cell Phone: ____________

Alternate Operator's Name: ____________ Cell Phone: ____________

GE HUDSON RIVER SEDIMENT REMEDIATION PROJECT
WATER OPERATIONS PERMIT

Company: ______________________ NYS Boating Safety Cert #: ______________________

Project Site Specific Health and Safety Training Completion Date: ______________________

4. REQUIREMENTS TO BE COMPLIED WITH
(To Be Completed by Applicant)

	Check Upon Verification Requirement Met
Project RA HASP and/or contractor-specific HASP has been read and understood by all participants	☐
Work Crew Project Orientation and Onboarding Requirements Completed	☐
Valid Insurance	☐
Contractor Health & Safety Plan Submitted	☐
JSAs Completed for work task and attached to permit application	☐
VHF Marine Radios on each vessel	☐
Minimum Safety Equipment Onboard *(as outlined in task JSA)*	☐
All Workers Have Proper PFDs	☐
All Workers Have Survival Suits *(cold temperature requirement)*	☐
Proposed Vessels have adequate power for intended task	☐
Copy of the daily vessel inspection attached to Float Plan	☐

5. SPECIAL NOTES

1. All vessels are required to check-in with the CM prior to heading out on the water. Upon docking at destination at end of work task or end of day, a check out call to the CM is required. **CM Safety – 518-361-7597 or joseph.montinieri@parsons.com**
2. A review of this Operations Permit must be completed with the vessel operator
3. Maintain communication on **Marine Band 13**.
4. Other:

6. CERTIFICATION

By signature, I certify that all of the information completed above is accurate and that I will comply with all safety procedures and this permit. I will review the contents of this permit application with all members of the work crew to which it applies.

Permit Request Originator Name *(Please Print)* ______________________ Permit Request Originator Signature ______________________ Date ______________________

WATER OPERATIONS PERMIT, FLOAT PLAN AND FIELD ACTIVITIES TRACKING STANDARD OPERATING PROCEDURE

PURPOSE

This water operations permit, float plan and field activities standard operating procedure (sop) defines the required process for submitting water operations permits and float plans before any Hudson River PCB superfund project work is undertaken within six feet of or on water bodies including rivers, streams, creeks, canals, storm water basins, and swamps.

APPLICABILITY

This sop applies to all contractors, including subcontractors, conducting fieldwork on behalf of GE for the Hudson River sediment remediation program (project). It includes work on the dredging, floodplains, ecological investigations, dredge spoils, remnant deposit, Hudson Falls, and Ft. Edward 004 projects. If you are not certain if this applies to your scope of work, please contact your GE project manager.

REQUIREMENT

In addition, if the work involves the use of a boat or vessel, a fully completed Float Plan (the attached float plan example provides the minimum level of detail to be provided) must be provided to the CM every day BEFORE the boat or vessel departs from its mooring or launch location. If a vessel traffic control center is being used and can be reliably contacted within the entire area where work is intended to be performed, boats will not be required to complete a Float Plan, but will be required to follow the procedures in use by the vessel traffic control center.

If the work is strictly land-based, a two-week look-ahead schedule detailing the field activities to be performed shall be submitted to the CM on a weekly basis each Monday morning. The two-week look-ahead schedule shall describe the work to be performed, contractor performing the work, staff assigned and days the work will be performed.

PROCEDURE

1. The contractor field manager or other designated responsible person shall complete and submit for approval an initial Water Operations Permit to the Project CM at least one week in advance of the anticipated work start date. All sections of the permit shall be fully completed. Contractors shall follow the applicable requirements of Sections 4 and 5 of the RA Health and Safety Plan (HASP) and the contractor HASP for the development of a Job Safety Analysis (JSA) and use of PPE in support of the Water Operations Permit (Part 4). The relevant JSAs shall be included with the Water Operations Permit.
2. A PDF scan copy of the permit submission should be submitted to CM Document Controls at the following e-mail address: Sheila.Lamb@Parsons.com. For those

contractors with formal submittal requirements in their Agreement with GE, the permit submission shall be assigned an appropriate submission number and processed according to the specification requirements.

3. Any additional information requested by the CM shall be provided in a timely manner and work will not be allowed to commence until the additional information has been received and approved.
4. Once the permit has been reviewed by the CM and approved, a copy of the approved permit shall be provided to the contractor. The approved permit shall then be reviewed with all employees participating in the water work as part of a pre-work activity and a copy shall also be available for review at the work area.
5. During the period in which the work is conducted, Water Operations Permit updates shall be submitted to the CM if any information on the permit has changed.
6. In addition, for any Water Operations Permit activity involving use of a boat or vessel not covered by a vessel traffic control center, a Float Plan shall be submitted to the CM every morning for each boat or vessel that will be working that day. The completed and signed Float Plan shall be submitted to CM Document Controls at the e-mail address above and a copy provided to the CM field representative at the morning contractor work meeting. It is the responsibility of the designated boat captain of each boat / vessel to ensure that the CM is in possession of their daily float plan before leaving the dock, or launch point for any water project work. When there are multiple vessels involved, each individual vessel must file an individual float plan.
7. The contractor field manager or other designated responsible person shall notify the CM field representative that work is completed for that day within 30 minutes of arrival at the dock or launch point. In addition, the contractor field manager or other designated responsible person shall notify the CM field representative if a boat /vessel is to be delayed more than 60 minutes from the planned arrival time detailed on that day's Float Plan.
8. The contractor field manager or other designated responsible person shall immediately notify the CM Safety Manager and River Operations Manager in the event that no delayed arrival time has been established and a boat or vessel has not returned to the dock by the time designated on that day's Float Plan. In this event, the contractor shall endeavor to make contact with the boat captain; if communication is not established, the emergency plan to locate the boat/vessel will be initiated. Refer to RA HASP Section 1350, Part 1.13, Paragraph K.

Blank PDF or paper copies of the Water Operations Permit can be obtained from the CM and the Float Plan template can be obtained at the following link:

http://www.floatplancentral.org/download/USCGFloatPlan.pdf

USCG Float Plan

Instructions: Complete this form and leave it with a reliable person who can be depended upon to notify the Coast Guard, or other rescue organization, should you not return or check-in as planned.

Vessel

Identification:
Name & Home Port:
Registration # :
Year & Make:
Length: Type: Power Hull Mat:
Hull Color: Draft:
Prominent Features:

Telecommunications:
Radio Call Sign:
DSC MMSI no.:
Radio 1 Type: Monitored Chan:
Cell Phone Number:
Pager Number:

Navigation (check all on board):
Maps Charts Compass GPS
Radar Loran C Sounder

Propulsion:
Primary - Type: No. Eng:
Auxillary - Type: None Fuel Capacity:

Safety and Survival

Visual Distress Signal
Day Only:
Night Only:
Day and Night Type:

Audible Distress Signal
Horn/Whistle:
Bell:

Other Gear:
Lifeboat: Flashlight:
Dinghy/Skiff: Signal Mirror:
Food & Water: Sea Anchor/Droque:
EPIRB:
Foul Weather Gear:

PFDs
Quantity on Board:

Ground Tackle
Anchor? Line Length:

Persons on Board

Operator: Age M/F Special Conditions - can't swim etc.
Name:
Address: Has experience w: Boat? Area?
City: State: Zip: Home Phone:
Vehicle: (yr, make, model): Vehicle License #:
Trailer parked at: Trailer License #:

Passengers/Crew name and address: Age M/F Special Conditions- can't swim, medical
1)
2)
3)

Itinerary

	Date	Time	Location	Travel Mode	Reason for stop	Check in Time
Depart: Arrive:						
Depart: Arrive:						
Depart: Arrive:						
Depart: Arrive:						
Depart: Arrive:						
Depart: Arrive:						
Depart: Arrive:						

Contact 1: Phone Number:
Contact 2: Phone Number:

APPENDIX A

CONTRACTOR HEALTH AND SAFETY PLANS

CONTRACT 3B – SHAW ENVIRONMENTAL, INC. February 2009 (Rev. 3)

CONTRACT 5 - AECOM CORPORATION. May 2010

CONTRACT 30 – SHAW ENVIRONMENTAL, INC. May 2011

CONTRACT 40 – CASHMAN DREDGING & MARINE CONTRACTING CO. May 2011

CONTRACT 50 – (Contractor not yet selected)

CONTRACT 60 – FINGER LAKES RAILWAY. May 2011

ARCADIS. May 2010

ANCHOR QEA, LLC. July 30, 2010

Copies of the contractor HASPs are available for review at the CM office or the office of the specific contractor.

APPENDIX B

GE EHS REQUIREMENTS

GE ENVIRONMENTAL, HEALTH, AND SAFETY REQUIREMENTS

Construction Management Services Agreement

Between General Electric Company and CM

1.0 GENERAL SCOPE

CM recognizes that the life, health and safety of persons and property during performance of the work is a material requirement of this Agreement. Accordingly, CM pledges to implement all necessary precautions for the prevention of accidents, and shall cooperate fully with Owner in addressing and resolving with due diligence any safety concerns that may be raised by Owner or its consultants during execution of the work, including, without limitation, the immediate suspension of all work until such time as pending safety issues are satisfactorily resolved. Notwithstanding the foregoing, CM shall remain primarily responsible for all its acts and omissions, and those of its employees, agents, subcontractors and suppliers, and their respective employees, agents, sub-subcontractors, and suppliers, regardless of tier, including those affecting life, health, and safety of persons and property.

2.0 COMPLIANCE WITH LAWS, RULES, REGULATIONS & STANDARDS

A. CM shall comply, and shall require its employees, agents, subcontractors, and suppliers, and their respective employees, agents, sub-subcontractors and suppliers, regardless of tier, with:

1. the requirements of all applicable National, Provincial, and Local laws, rules and regulations, including but not limited to those governing building construction, use of tools and equipment, and the safety of persons and property;
2. all rules and regulations of OSHA or other applicable governmental entities, Owner, and any other stakeholder which may be in effect at the job site regarding employment, passes, badges, smoking, fire prevention, environmental, health, safety, and conduct on the property; and
3. the highest (most stringent) applicable industry standards concerning the preservation of life, health, and safety of persons and property in the performance of the work shall apply.

B. Failure by CM to comply with the requirements of this clause, including the failure to enforce its requirements on its employees, agents, subcontractors, and suppliers, and their respective employees, agents, sub-subcontractors and suppliers, regardless of tier, shall be considered a material breach of the Agreement. Failure to comply with safety and security requirements is cause for work stoppage and termination of personnel from the project. Repeated and/or willful violations are cause for termination of the contract.

3.0 SAFETY

A. The CM shall:

1. Receive and acknowledge Owner's contractor safety rules and regulations for the project's operating site (if applicable). Furthermore the CM will review these safety rules with its employees, agents, subcontractors and suppliers, and their respective employees, agents, sub-subcontractors, and suppliers, regardless of tier, including those affecting life, health, and safety of persons and property.

2. Provide a site-specific EHS plan that addresses the identification of site hazards inclusive of a mitigation plan to address those hazards. The CM shall also request and receive a similar site-specific EHS plan from their subcontractors.
3. Take all necessary precautions for the safety of all persons and property on the Project;
4. Erect and properly maintain at all times, as required by job conditions and progress of the work, all necessary safeguards for the protection of the workmen and the public;
5. Post danger signs warning against the hazards created by such features of construction as protruding nails, bad hoists, well holes, hatchways, scaffolding, window openings, stairways, dangers from falling materials, etc.;
6. Not load or permit any part of the Work to be loaded so as to endanger its safety; and
7. Shall designate a responsible member of his organization on the worksite whose duty shall include the prevention of accidents.

In any emergency affecting the safety of persons or property, CM shall act, at CM's discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the CM on account of such emergency work shall be determined by agreement of the parties.

By executing this Agreement, CM warrants and certifies to Owner that its employees, its subcontractors' employees, and all persons employed by or through CM pursuant to this Agreement, have been properly trained in safety procedures associated with their trade and construction in general.

1. CM shall request and keep on file at the project site all EHS training documentation of its employees, agents, subcontractors and suppliers, and their respective employees, agents, sub-subcontractors, and suppliers, regardless of tier.

CM further warrants and certifies that it shall exercise due diligence and care in the supervision of the personnel so employed, to ensure that such safety procedures and practices are properly observed at all times during execution of the Work.

4.0 SUPERVISION AND DISCIPLINE

A. The CM shall provide a competent Superintendent who is authorized to act for him and has been approved by the Owner. Such Superintendent shall be on the Project site at all times when Work is being performed. CM shall be solely responsible for all construction means, methods, techniques, sequences and procedures, and for supervising the work of the subcontractors and materialmen and coordinating all portions of the Work.

CM shall at all times enforce discipline and good order among all persons employed on the Project by himself and his subcontractors and materialmen and he shall not employ nor allow anyone to employ on the Project any unfit person, anyone not skilled in the work assigned to them, nor anyone who fails or refuses to adhere to safety requirements in effect at the jobsite.

5.0 USE OF THE SITE

A. The CM shall confine operations at the site to areas permitted by law, ordinances, permits, and the Contract, and shall not unreasonably encumber the site with any materials or equipment.

B. The CM shall keep the job site and adjoining premises clean at all times of rubbish caused by him or his subcontractors, and at the completion of Work shall remove all rubbish, tools, equipment, surplus material and temporary structures and installations, leaving the premises clean and ready for use.

6.0 SUBCONTRACTED WORK

A. The CM may perform such portions of the Work with his own forces as his qualifications and experience shall permit. Prior to the award of any subcontract, the CM agrees to obtain pre-qualification information from the proposed subcontractor, and to submit for Owner's review, such subcontractor's environmental, health and safety history and training records.

B. The CM shall remain primarily responsible and liable for performance of the entire Work, regardless of whether the Owner has given approval or consent to a particular subcontractor, subcontract or any other matter in connection with either.

7.0 MINIMUM OWNERS REQUIREMENTS

The CM agrees to document all findings (hazardous conditions and hazardous acts) through the performance of daily inspections. Findings must be corrected and tracked to closure within 24 hours. The system(s) used for tracking must be able to trend the data.

All accidents and near misses must be reported to the Owner's Project Manager and EHS Manager immediately. Accident investigation reports must also be submitted and an accident/incident log kept for each project.

The CM agrees to develop/review a Task Hazard Analysis (mitigation plan) for all Construction Manager High Risk Operations as described in the attached *Owner's Construction/ Renovation EHS Requirements.*

Owner's EHS team may audit the site and may require access to all CM EHS files to measure conformance with this agreement. The CM agrees to correct all audit deficiencies within the specified time noted in the audit.

The CM will provide a monthly safety highlight report to the Owner's Project Manager and EHS Program Manager indicating field man-hours worked each month sorted by contractor and subcontractors of all tiers, recordable and lost time accidents, incidence rates and EHS highlights. A sample report is included in the *Owner's Construction/Renovation EHS Requirements.*

Prior to erecting, installing, constructing, repairing, adjusting, inspecting, operating, or maintaining any equipment or process where unexpected energization, start up, or release of hazardous energy sources will be isolated, locked and tagged out, e.g. electrical, pneumatic, hydraulic, gravity, electrical storage devices, capacitors, springs, and other mechanical. The CM must implement procedures that provide equal to or better than the General Electric LOTO program. **These procedures must be reviewed by authorized Owner's personnel before work commences.**

8.0 WORKMANSHIP

The CM shall perform the Work in a good workmanlike manner and in strict accordance with the Contract and complete the Project in a professional and timely manner. The CM will be responsible to the Owner for the acts and omissions of all of his employees and all subcontractors, their agents and employees, and all other persons performing any of the Work under a contract with the CM.

9.0 CORRECTION BY OWNER; SUSPENSION OF WORK

In the event that the CM shall fail to prosecute the Work in accordance with the Contract, or shall otherwise default thereunder, the Owner may, without terminating the Contract and without prejudice to any other remedy he might have, order the immediate suspension of the work, terminate the Contract, or cure said default at the expense of the CM following written notice thereof.

10.0 INDEPENDENT CONTRACTOR

CM is and shall remain for all purposes an independent contractor, and he shall have no power, nor shall he represent that he has any power, to bind Owner or to assume or create any obligation, expressed or implied, on behalf of Owner.

OWNER'S CONSTRUCTION/RENOVATION EHS REQUIREMENTS

PERSONAL PROTECTIVE EQUIPMENT

- Hard Hats are required at all times in the construction work area.
- Appropriate eye and face protection that complies with ANSI Z87 shall be worn at all times. Safety glasses with side shields are required as a minimum.
- Sensible and safe work clothing/shoes must be worn. This means the wearing of shirts with a minimum 4" sleeve.
- Shorts, cutoffs, sleeveless shirts, tank tops, sneakers and running shoes are strictly prohibited.
- At a minimum, substantial shoes must be worn on all project sites. No canvas or leather sneakers (even if equipped with steel toe) or sandals will be worn. All construction boots or shoes designed to accommodate laces must be fully laced.
- Appropriate hearing protection shall be worn in work areas where levels exceed established standards.
- Suitable gloves must be worn to protect the hands from injury as appropriate for the work to be performed.
- Approved respirators must be used when excessive dust, mist, fumes, gases or other atmospheric impurities are present.
- Safety harnesses and secured safety lanyards or retractable lifelines must be used when working from unguarded work surfaces where falls greater than 6 feet/1.8m present a hazard. (NOTE: Site requirements may limit this potential fall length to 4 feet/1.2m) Lanyards or retractable lifelines must be secured to separate lifelines and independent connection points capable of withstanding the load of a potential fall.
- Proper personal protective equipment must be worn for welding and burning.
- Welding screens must be used when welding operations are in the vicinity of other employees.
- Electric insulating protective equipment, such as rubber gloves, blankets, hoses, boots, etc. Shall be inspected before use.
- High visibility warning vests or other suitable garments marked with or made of reflectorized or high-visibility material must be worn when working in roadways or around heavy excavating equipment.

GENERAL SAFETY & SECURITY GUIDELINES

- Alcoholic beverages, recreational drugs and people under the influence of these substances are not permitted on site.
- Weapons and firearms are strictly prohibited.
- No food or drink will be allowed in the construction work area except in the designated eating area.
- Music radios/headsets are prohibited.

- No cameras or video equipment are permitted on site except as necessary to document the progress of the Work and as may be allowed under the specific Site Security guidelines.
- Smoking is not permitted in any building (including the building footprint and roof). Smoking is allowed in designated areas only.
- Horseplay and fighting is prohibited.
- Barricaded or roped of areas are considered danger zones and should be respected as such. Admittance to such areas is prohibited without authorization.
- Protect floor openings by providing adequate barricades and secured covers. All covers must be painted with high-visibility paint or shall be marked with the word “HOLE” or “COVER” to provide warning of the hazard.
- No one will be allowed to enter the site without proper identification. All trade workers, vendors, and visitors must comply with the Owner’s badge and access program.
- Do not prop exit doors.
- Throwing or dropping materials from one level to another is prohibited.
- No toxic chemicals or other types of pollutants may be disposed of in the on-site sewerage systems, either storm or sanitary.
- All gas cans and other liquid chemicals must remain in secondary containment devices.
- No riding in the back of pick-up trucks.
- Park in designated contractor-parking areas.
- The driver of any motor vehicle on company property is responsible for its safe condition and use. The vehicle owner must promptly correct any malfunction of brakes, lights, horn, or exhaust system. The driver is required to have a valid driver’s license and the vehicle must have a valid license plate. All traffic rules must be obeyed and pedestrians have the right of way at the Owner’s site.
- All deliveries and use of special equipment will be through areas designated by the Owner. The Owner’s facility has minimal staging and storage areas designated for construction use. All contractors must schedule and coordinate deliveries in order to minimize the necessity of storing materials prior to installation.
- Area and personal air monitoring required by federal, state or local regulations shall be the responsibility of the CM.

HOUSEKEEPING

- Cleanliness and orderliness are the first fundamentals of good housekeeping.
- Contractors are responsible for cleaning up and removing hazardous and non-hazardous waste generated on site.
- Each Contractor shall be responsible to maintain areas where he is performing work free from waste materials, debris and rubbish. Work will not be considered complete until all waste materials are removed and the work area returned to a clean and orderly condition. Waste material must be disposed of off-site.
- All protruding nails in form lumber, boards, etc., must be withdrawn or bent into the wood before the wood is stacked or piled.

- Rags, packing materials, paper cups, and sawdust in saw areas must be collected daily and placed in proper containers.
- All objects with sharp edges (scrap sheet metal, scrap glass, bottles, metal cans) shall be collected daily and placed in containers.
- Avoid placing debris and other obstacles in roadways, walkways, aisles and other travel routes.
- Allow sufficient time at the end of each day for proper cleanup of the work area. Place all debris in proper refuse containers.
- All stored material must be kept in an orderly manner at all times.
- Provide a proper collection container and floor protection when using cutting oil, solder flux, hydraulic oil, and other fluids.
- In the event of a large spill, immediately install acceptable containment barriers.

LADDERS

- The use of metal and wood ladders is prohibited. All ladders shall be heavy duty, industrial strength. The use of fiberglass, or aluminum/fiberglass composite ladders is acceptable. Job-made wooden ladders shall only be allowed upon approval from the Owner's EHS Program Manager.
- Stepladders must be fully open. They cannot be used as straight ladders.
- Tie-off all straight and extension ladders to keep them secure. Straight and extension ladders must extend three feet (3') beyond the top landing. The base of the ladder shall be set out at least one-fourth of the ladder height measured from bottom to point of bearing.
- Any ladder found defective shall be removed from service and destroyed (vertically) or repaired to original specifications.
- Do not place ladders in blind spots (doorways, driveways) or in egress ways unless properly barricaded or guarded.

TOOLS & EQUIPMENT

- Defective tools and equipment must be taken out of service and shall be properly repaired before reuse.
- Machinery, tools (including portable grinders and buffers) and equipment with exposed gears, belts, power transmission, couplings, etc. shall not be operated without effective guards in place.
- The use of gasoline and propane powered equipment in the building is strictly prohibited.
- A motor vehicle engine shall not be left running if the vehicle/equipment is unattended unless it is necessary in the normal operational requirement of the unit. Unattended means that the operator has left the normal control position of the vehicle.
- All moving equipment must be equipped with back-up alarms.
- Store or stack equipment and material so that it will not create a falling or tripping hazard or block access to fire extinguishers or emergency exits.

COMPRESSED GAS CYLINDERS

- Defective tools and equipment must be taken out of service and shall be properly repaired before reuse.
- To avoid accidental displacement, keep compressed gas cylinders standing and securely tied off, whether empty or full. Make sure valve protection caps are on when cylinders are not in use. The valve shall be closed on all empty cylinders.
- When moving cylinders by crane or derrick, a cradle, boat or suitable platform shall be used. Slings or hooks shall not be used.
- When cylinders are not in use, they must be secured and capped.
- If cylinders are not used within a 24-hour period, they are considered to be in storage, and must be secured, capped and separated. Separate oxygen and fuel gas cylinders by a minimum of 20' or a 5' high, ½ hour fire-rated barrier.

FIRE PREVENTION

- Use only approved cleaning agents — never gasoline or flammable liquids.
- Gasoline and similar flammable liquids must be stored only in approved safety containers and in areas free of burning hazards.
- Keep all heat sources from flammable liquids, gases or other combustible materials.
- Open fires are strictly prohibited.
- Every hot work operation must have a properly trained and equipped fire watch with appropriate fire extinguishers for the specific hazard in the work area. The fire watch must remain in the work area for at least 30 minutes after the hot work activity is completed.

FALL PROTECTION

All workers in an area exposed to a fall greater than 6 feet (1.8m) must use appropriate fall protection. Such protection includes:

- Guardrail systems
- Safety net systems
- Personal fall arrest systems

Other protection methods include:

- Controlled access zones
- Controlled decking zones
- Hole covers
- Positioning device systems
- Equipment guards
- Fences and barricades
- Warning line systems in combination with guardrail systems, safety net systems, personal fall arrest systems or safety monitoring systems.

Exception: When the employer demonstrates that it is infeasible or creates a greater hazard to use these systems, a fall protection plan that meets the OSHA requirements must be developed for review and implemented.

Fall protection is required but not limited to the following when a worker is exposed to a fall of six feet (1.8m) or more:

- Performing steel erection work
- Working on scaffolds
- Unprotected sides and edges
- Overhand bricklaying and related work
- Leading edges
- Roofing work on low-slope roofs
- Hoist areas
- Steep roofs
- Holes
- Precast concrete erection
- Formwork and reinforcing steel
- Wall openings
- Ramps, runways and other walkways
- Walking/working surfaces
- Excavations
- Aerial lifts
- Dangerous equipment
- Metal decking operations
- Erecting, dismantling and working on scaffolds

The provisions in this section do not apply when:

- Employees are making an inspection, investigation or assessment of workplace conditions prior to the actual start of work or after all construction work has been completed
- Working on certain cranes and derricks
- Working on certain types of equipment used in tunneling operations
- Engaged in the construction of electric transmission and distribution lines and equipment
- Working on stairways and ladders
- Tradespeople shall not stand on motors, pumps, conduits or the like to gain access to elevated work.
- Use of Safety Monitor System (SMS), Controlled Access Zone (CAZ), or Controlled Decking Zone (CDZ) will not be accepted unless prior approval from Owner’s EHS Program Manager has been received.

- Working on a roof within six (6) feet (1.8m) of the edge or a floor opening requires appropriate fall protection (guardrail systems, safety net systems, or personal fall arrest systems). Use of a safety monitor system or controlled access zone will not be accepted without prior approval from Owner's EHS Program Manager.
- Safety harnesses must be worn at all times in scissors and personnel lifts. Chains must be closed. Harnesses must be secured to an approved tie-off point when breaking the plain of the lift.
- Safety harnesses must be secured to an approved tie-off point in all aerial lifts.
- Establish a barricaded or roped off danger zone around lifts for falling objects.

Hoisting of personnel on a personnel platform by a crane or derrick is prohibited, except when the erection, use, and dismantling of conventional means of reaching the worksite, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous or is not possible because of structural design or worksite conditions. This type of operation must meet the requirements of OSHA 1926.550(g).

Workers must wear a safety harness with his/hers safety lanyard secured to a separate lifeline while working from swing scaffolds, boatswain's chairs, or other suspended work platforms where a fall hazard is present.

CM's written Fall Protection Program - CM must develop a written Fall Protection Program and it must be communicated to all affected employees. The program will contain the following elements:

- Hazard identification
- Selection of fall hazard control
- Equipment inspection and maintenance
- Employee training

CM must conduct a fall hazard assessment to address both routine ongoing activities and tasks as well temporary activities, which may take place during maintenance and construction.

Control measures will be identified, implemented and communicated by the CM. Documentation of fall hazard control measures should be included in THAs, safe work plans or other operating procedures.

CM workers must be trained in the requirements of the fall protection program including use of fall protection equipment as appropriate.

<u>Contractors must inspect and maintain fall protection equipment in accordance with manufacturer's recommendations.</u>

SCAFFOLDING

- All scaffolds must be inspected before use and must be designed for the safe working load.
- Only scaffold planking tested and approved to carry the load may be used. Scaffold planking must be secured by tying or cleats to prevent slipping. Mark scaffold planks (in most cases the manufacturer does this) and use only on scaffolds.
- Handrails and toeboards shall be used on all scaffolds and the scaffold secured as required.

- Rolling tower scaffolds must be locked while the scaffold is in use. Tower must be free of personnel, material and equipment before being moved. Rolling scaffolds are not to be moved from the top.
- Ladders must be used for accessing scaffolds. Climbing of bracing is prohibited.
- Scaffold platforms more than 6 feet (1.8m) above any working surface must be equipped with a guardrail system–
- Top rails (42" (1.1m) plus or minus 3” (8cm), mid rails (midway between the top rail and the scaffold platform) and toe boards or personal fall arrest systems must be implemented.
- No scaffold shall be erected, moved, dismantled or altered except by trained and qualified personnel under the authority of the competent person.
- Abide by the Scaffold Tag System
  - *GREEN*–complete scaffold per required safety standards.
  - *YELLOW*–conditional use—100% fall protection required.
  - *RED*–Scaffold not complete. Do Not Use.
- Makeshift platforms, such as stacked materials, chairs, boxes, or drums shall not be used.
- Scaffolds shall be built to OSHA standards (1926.451).
- **Tubular Welded Frame Scaffolds have additional special safety requirements:**
- Scaffold legs shall be set on adjustable bases, plain bases or other foundations adequate to support the maximum rated load.
- To prevent movement, the scaffold shall be secured to the building or structure at intervals not to exceed 30 feet (9.1m) horizontally and 26 feet (7.9m) vertically.
- All pins to secure diagonal braces and to prevent uplift shall be used.
- **Outriggers and platforms below the working/walking level shall be fully planked. O**utriggers shall be tied to the frame.
- Scaffolds may not be used as material hoist towers or for mounting derricks without first determining the loads and stress involved.
- All scaffolds shall be free of tools, trash, etc. before calling in for removal.

CRANES, HOISTS & RIGGING

- Never raise a load over people or occupied buildings.
- **Tag lines must be used to control every load.**
- Rigging operations utilizing chains is not permitted without prior approval from Owner EHS Program Manager.
- Multiple-lift rigging is strictly prohibited.
- All materials shall be rigged to prevent unintentional displacement. H**ooks with self-closing safety latches shall be used** to prevent components from slipping out of the hook.
- Defective rigging equipment shall be tagged and removed from service.
- Only qualified operators may operate power equipment. Seat belts must be worn wear applicable.

- Cranes and Hoists
- Safe lifting procedures for cranes and hoists must be developed and documented.
- Crane and hoist operators and qualified riggers must conduct rigging equipment inspections prior to each use on each shift and as necessary during its use to ensure that it is safe.
- All operators of cranes and hoists should have received training that addresses safe operating practices for all crane types that they will be operating on site.
- Preventative maintenance must be conducted on cranes and hoists in accordance with manufacturer's guidance or local regulatory requirements.
- Contractors must submit copies of detailed and documented annual inspections conducted by qualified individuals.
- Riding on hooks, headache balls or slings of hoisting equipment is strictly prohibited.

ELECTRICAL

- Electrical equipment shall not be installed, repaired, or removed except by trained qualified electricians.
- Electrically operated equipment (stationary and portable) must be grounded.
- When extension cords, power tools or equipment cords are frayed or worn, or when bare wire is showing, the equipment must be tagged and taken out of service.
- Do not use electrical tape on extension cords.
- Temporary cords should be supported a minimum of 8' above the floor in egress walkways, corridors and areas requiring employee access.
- Temporary lighting must be guarded.
- All 120-volt, single phase 15 and 20-ampere receptacle outlets on construction sites, which are not a part of the permanent wiring of the building or structure and are in use by employees, shall have approved Ground Fault Circuit Interruption (GFCI) for personnel protection. When using the permanent receptacles, GFCI devices must be installed on each extension cord prior to the source receptacle.
- Lock-out/Tag-out programs represent a lifesaving control. Compliance with Owner's procedures is mandatory.
- Equipment-specific energy control procedures are required for all lock-out/ tag-out operations.
- Extension cords must be at least 16-gauge heavy duty 3—wire with a UL approved three prong grounded plug.
- 110-volt outlets on portable generators and welders shall be 3-way (NEMA 5-15R) grounded to the frame. The power lead shall be connected through a Ground Fault Circuit Interrupter.

CONTRACTOR HIGH RISK OPERATIONS/HIGH HAZARD ACTIVITIES

All major construction activities on this project must be carefully analyzed to determine appropriate safety controls to ensure worker safety and health in accordance with Federal, State, and local regulations and Owner compliance. Reviewing the construction activities prior to the CM's arrival on site or the start of any special construction activity allows all parties to plan for safety.

Work that has a high risk of resulting in a serious worker exposure, injury, or death or an environmental violation is considered a high-risk operation. A Task Hazard Analysis or Mitigation Plan is a procedure which identifies potential hazards specific to a scope of work or activity and defines actions required by specifying locations, safety precautions, activities involved and the work sequencing so that the operation will take place in the safest manner possible. A Task Hazard Analysis or Mitigation Plan will be required for, but not limited to, all of the following activities: Operations involving the shut-down and start-up of fire alarm systems, fire protection systems and sprinkler systems in occupied facilities, operations involving shut down and start-up of process piping, electrical systems, hydraulic systems and elevators/escalators; trenches and excavations greater than 5 feet in depth or that require a shoring system; elevated work activities including work on a roof or major scaffold; work to be performed on existing equipment; installation or removal of equipment or machinery, work involving existing piping, vents, or drains, piping tie-ins and line breaking; any hazardous painting, floor or wall coating (epoxy paints, electro-static painting, cocooning); asbestos abatement; working on/with lead containing materials; demolition work; structural steel erection; major scaffold erection; use of ladders above 24 feet; elevated work requiring the use of fall protection; hot work (welding, cutting, brazing) in hazardous areas or near hazardous materials; passivation; confined space entry; control of hazardous energy and line breaking (lock out/tag out); any activity which will impede a sidewalk, roadway, or building entrance (in occupied facilities or public areas); crane and/or hoist operations; Critical lifts (defined as any lift meeting one of the following four criteria) - lifts which exceed 75% of the cranes rated capacity or other lifting equipment configuration, lifts that require the use of more than one crane or in combination with other lifting equipment approved for hoisting or rigging purpose, lifts which are located in an area or areas where conditions present exposures to electrical hazards, underground hazards, overhead piping systems, vessels, operational buildings, etc., lift s of equipment which are identified as specialized equipment, "one of a kind" which has been designed, engineered and fabricated for a specific process of the owner. This will include equipment specified by the owner such as glass-lined reactors, vessels, etc.; and any other unusual activity that may require review of the tasks and hazards involved.

A Task Hazard Analysis/Mitigation Plan must be documented by the CM/Subcontractor to ensure a safe working environment. Procedures regarding work permits (where applicable) should be defined in the THA.

All attachments (training documents, crane location plans, crane swing radius information, Material Safety Data Sheets, etc.) must be included with the mitigation plan submission. The THA must be submitted to the Owner for review a minimum of 48 hours prior to the scheduled operation.

The CM's competent person must review the Task Hazard Analysis with the work crew prior to the commencement of the activity and on a daily basis or as conditions (such as weather) change.

Reference guidance document *Task Hazard Analysis Framework for Contractor High Risk Operations* located on GE Corporate Contractor Safety Support Central.

LOCK OUT TAG OUT

The LOTO standard applies, but is not limited to activities that are performed on a machine, a piece of equipment, a process, or circuit. Primary, secondary, stored and single source energy sources require a lockout when performing servicing and/or maintenance activities. Primary energy sources are the main energy sources such as electricity, gas, fluids, etc., provided to machines, equipment, processes and circuits. Shut down machinery with moving parts or process equipment in service before adjustments or repairs. Owner's LOTO procedures must be followed.

If shut down is not feasible a risk assessment must be used. The risk assessment explores the safest conditions possible for individual work assignments. Risk assessment establishes safe practices and alternative methods to reduce the possibility of injury when normal LOTO procedures cannot be applied. A task hazard analysis (mitigation plan) and written procedures specific for the job must be completed and reviewed with Owner prior to start.

Never remove warning or danger tags or locks on any apparatus, valves or switches unless you have been instructed to do so, and then only by the persons who attached them.

Contractors who are involved with equipment/systems and are potentially exposed must implement procedures that provide protection equal to or better than the General Electric LOTO program. LOTO programs for outside services or contractors must be reviewed by authorized General Electric personnel.

The contractor supervisor must be made aware of the overall LOTO procedure and informed of the equipment specific procedure by an Owner Authorized Representative.

Contractors must place their own locks and tags (one lock, one key, one person) and verify LOTO by try-out. As a best practice, the Owner's Authorized Representative may perform the LOTO step-by-step process. The contractor will then be required to attach and secure their individual LOTO locks and red tags to the same energy-isolating devices that the Owner representative has locked out.

All Contractor workers involved in a LOTO operation must have documentation of LOTO training. This documentation must be available for audit at the work site.

CONFINED SPACE

A confined space is an enclosed area that has each of the following four characteristics: 1) Large enough and so configured that an worker can bodily enter and perform assigned work, 2) Has limited means for worker entry and exit due to the number, size, or location of openings, 3) Is not designed for continuous worker occupancy, 4) Contains or may contain a serious safety or health hazard. Such hazards include currently or potentially hazardous atmospheres, potential worker entrapment (from inwardly converging walls or downward sloping floor), or potential worker engulfed by stored materials. Examples of confined spaces include tanks, vessels, pits, sewers, pipelines, boilers and utility vaults.

Entry into a confined space shall be conducted only if necessary to do assigned work. Whenever possible, assigned work shall be completed from outside the space.

Entry into a confined space is prohibited until atmospheric testing of the space and applicable entry procedures have been documented and permits completed.

All Contractor entrants and attendants must have documentation of confined space entry/attendant training.

Additional respiratory protection training and documentation will be required (if respiratory protection is needed).

This documentation must be available for audit at the work site.

All entrants and attendants must be informed of the entry procedures and mitigation plan prior to the entry.

The use of retrieval equipment is required for all confined space entries. The number of entrants must be equal to the number attendants and to the number of retrieval devices available.

STRUCTURAL STEEL ERECTION

The safety standards for structural steel erection will follow the OSHA regulations for Steel Erection Subpart R (1926.750-1926.761 inclusive of Appendices A-H) dated January 18, 2001 and revised on July 18, 2001 with the following exceptions and additions:

All workers, including connectors and dickers, must be protected from falls at or greater than six (6) feet (1.8m).

Multiple lift rigging procedures (Christmas treeing) is strictly prohibited.

The use of a Controlled Decking Zone (CDZ) is prohibited.

Cranes used in steel erection activities shall be visually inspected prior to each shift by a competent person. The inspection must include observation for deficiencies during operation. The inspection must be written and a copy submitted to Owner daily. Deficiencies constituting a hazard require that the hoisting equipment be removed from service until the deficiency is corrected.

At the end of the shift or when environmental or jobsite conditions require, metal decking must be secured against displacement.

Metal decking must be laid tightly and immediately secured upon placement to prevent accidental movement or displacement.

Wire mesh, exterior plywood or equivalent must be installed around columns where planks or metal decking do not fit tightly. The materials used must provide fall protection for personnel and prevent objects from falling through.

All columns must be anchored by a minimum of four (4) anchor bolts.

Anchor bolts should not be repaired, replaced or field modified without the approval of the project structural engineer of record.

WRITTEN PROGRAMS

The CM must submit a site-specific Health and Safety Plan for each project location that includes all Owner and any other Stakeholder’s EHS requirements.

The CM must submit a **Disciplinary Program** for review by Owner.

The CM must have a **Written Hazard Communication Program** on site inclusive of a Chemical Inventory List and Material Safety Data Sheets (MSDS) for all chemicals brought to the site.

An **Evacuation Plan** inclusive of a designated muster area must be put in place for the project. Evacuation drills and alarm testing may occur periodically.

The CM must submit LOTO and Confined Space Plans (if applicable)

REQUIRED REPORTS

The following reports must be submitted to Owner as noted:

MONTHLY SAFETY HIGHLIGHT REPORT – This report must include field man-hours monthly and cumulatively for each project, incidence rates (TCIR and DART), incidence rate charts, accident/incident log summary, and project EHS highlights. *See attached sample report.*

MONTHLY ACCIDENT/INCIDENT SUMMARY LOG – This log must include the date of any accident/incident, a description of the accident, specific injuries and treatment (if applicable), Contractor involved, injured worker's name (if applicable), type of accident (recordable, lost time, number of lost workdays and number of restricted days or job transfer) near miss, first aid, etc.), and comments indicating how the same or a similar accident will be prevented from recurring.

SAFETY VIOLATION LOG – A spreadsheet that is updated as required and forwarded to Owner monthly indicating the time of the violation, location of the violation, violator's name, company, supervisor' s name, type of violation, person who issued the violation, warning #/termination, and comments.

SAFETY OBSERVATION LOG/PROCESS – A process to document **all EHS observations** with a method to **track to completion** that includes a **sorting mechanism**. T**he log must be completed daily and forwarded to Owner weekly.** Process should include the following information: Date of the observation, Description of the observation, Observation type (electrical, ladder, etc.), Location, Contractor, and Date that the observation was corrected.

SAMPLE

MONTHLY SAFETY HIGHLIGHT REPORT

Safety Overview – January 2005

To date the _____________ project has worked _______ man-hours with _____OSHA recordable cases, one of which had ___days of restricted or lost work activity.

The project-to-date safety statistics for the __________________ project are:

CATEGORY	[1]NATIONAL AVERAGE	ACTUAL
Total OSHA Recordable Cases Incidence Rate (TCIR)	6.1	0
DART Incidence Rate (Recordable Cases with Days Away from Work, Days of Restricted Work Activity or Job Transfer)	3.1	0

During January 2005 there were:
Zero (0) OSHA Recordable Cases
Zero (0) Recordable Cases with Days Away from Work, Days of Restricted Work Activity or Job Transfer
Zero (0) Lost Workdays
Zero (0) Restricted Workdays
Zero (0) First Aid Cases
Zero (0) Incidents/Other
Zero (0) Near Misses

In January 2005, ________ man-hours were worked on this project bringing the project-to-date total to __________ man-hours.

Describe any accidents/incidents that occurred during the month here.

This month, ___ contractor workers and ___ Owner employees attended the site-specific safety orientation on the project. To date, ___ contractor workers and ___ Owner employees have attended this project safety orientation. This continues to be an excellent venue for explaining the team approach and jobsite safety rules for the project.

Describe % of observations corrected in 24 hours, overview of trends of findings, EHS issues and any other EHS process improvements here.

Attached are graphs indicating our project-to-date safety status as compared to the National Average for the Construction Industry.

[1] 2002 Bureau of Labor Statistics for Nonresidential Building Construction, SIC Code 154

APPENDIX C

OSHA STANDARD 1910.401 COMMERCIAL DIVING OPERATIONS

2011 RA HEALTH AND SAFETY PLAN

Part Number:	1910
Part Title:	Occupational Safety and Health Standards
Standard Number:	1910
Title:	Table of Contents

Subpart T -- Commercial Diving Operations

Part Number: 1910

• Part Title: Occupational Safety and Health Standards

• Subpart: T

• Subpart Title: Commercial Diving Operations

• Standard Number: 1910 Subpart T

• Title: Authority for 1910 Subpart T

• Appendix: A , B , C

Authority: Sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, and 657); Sec. 107, Contract Work Hours and Safety Standards Act (the Construction Safety Act) (40 U.S.C. 333); Sec. 41, Longshore and Harbor Workers' Compensation Act (33 U.S.C. 941); Secretary of Labor's Order No. 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), 3-2000 (65 FR 50017), or 5-2002 (67 FR 65008) as applicable; 29 CFR part 1911.

Source: 42 FR 37668, July 22, 1977, unless otherwise noted.

[58 FR 35310, June 30, 1993; 61 FR 9227, March 7, 1996; 69 FR 7363, Feb. 17, 2004; 71 FR 16673, April 3, 2006]

1910.401(a)

Scope.

1910.401(a)(1)

This subpart (standard) applies to every place of employment within the waters of the United States, or within any State, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, Guam, the Trust Territory of the Pacific Islands, Wake Island, Johnston Island, the Canal Zone, or within the Outer Continental Shelf lands as defined in the Outer Continental Shelf Lands Act (67 Stat. 462, 43 U.S.C. 1331), where diving and related support operations are performed.

1910.401(a)(2)

This standard applies to diving and related support operations conducted in connection with all types of work and employments, including general industry, construction, ship repairing, shipbuilding, shipbreaking and longshoring. However, this standard does not apply to any diving operation:

1910.401(a)(2)(i)

Performed solely for instructional purposes, using open-circuit, compressed-air SCUBA and conducted within the no-decompression limits;

1910.401(a)(2)(ii)

Performed solely for search, rescue, or related public safety purposes by or under the control of a governmental agency; or

1910.401(a)(2)(iii)

1910.401(a)(2)(iii)

Governed by 45 CFR Part 46 (Protection of Human Subjects, U.S. Department of Health and Human Services) or equivalent rules or regulations established by another federal agency, which regulate research, development, or related purposes involving human subjects.

1910.401(a)(2)(iv)

Defined as scientific diving and which is under the direction and control of a diving program containing at least the following elements:

1910.401(a)(2)(iv)(A)

Diving safety manual which includes at a minimum: Procedures covering all diving operations specific to the program; procedures for emergency care, including recompression and evacuation; and criteria for diver training and certification.

1910.401(a)(2)(iv)(B)

Diving control (safety) board, with the majority of its members being active divers, which shall at a minimum have the authority to: Approve and monitor diving projects; review and revise the diving safety manual; assure compliance with the manual; certify the depths to which a diver has been trained; take disciplinary action for unsafe practices; and, assure adherence to the buddy system (a diver is accompanied by and is in continuous contact with another diver in the water) for SCUBA diving.

1910.401(a)(3)

Alternative requirements for recreational diving instructors and diving guides. Employers of recreational diving instructors and diving guides are not required to comply with the decompression-chamber requirements specified by paragraphs (b)(2) and (c)(3)(iii) of § 1910.423 and paragraph (b)(1) of § 1910.426 when they meet all of the following conditions:

1910.401(a)(3)(i)

The instructor or guide is engaging solely in recreational diving instruction or dive-guiding operations;

1910.401(a)(3)(ii)

The instructor or guide is diving within the no-decompression limits in these operations;

1910.401(a)(3)(iii)

The instructor or guide is using a nitrox breathing-gas mixture consisting of a high percentage of oxygen (more than 22% by volume) mixed with nitrogen;

1910.401(a)(3)(iv)

The instructor or guide is using an open-circuit, semi-closed-circuit, or closed-circuit self-contained underwater breathing apparatus (SCUBA); and

1910.401(a)(3)(v)

The employer of the instructor or guide is complying with all requirements of Appendix C of this subpart.

1910.401(b)

Application in emergencies. An employer may deviate from the requirements of this standard to the extent necessary to prevent or minimize a situation which is likely to cause death, serious physical harm, or major environmental damage, provided that the employer:

..1910.401(b)(1)

1910.401(b)(1)

Notifies the Area Director, Occupational Safety and Health Administration within 48 hours of the onset of the emergency situation indicating the nature of the emergency and extent of the deviation from the prescribed regulations; and

1910.401(b)(2)

Upon request from the Area Director, submits such information in writing.

1910.401(c)

Employer obligation. The employer shall be responsible for compliance with:

1910.401(c)(1)

All provisions of this standard of general applicability; and

1910.401(c)(2)

All requirements pertaining to specific diving modes to the extent diving operations in such modes are conducted.

[42 FR 37668, July 22, 1977, as amended at 47 FR 53365, Nov. 26, 1982; 58 FR 35310, June 30, 1993; 69 FR 7363, Feb. 17, 2004]

Part Number: 1910

• Part Title: Occupational Safety and Health Standards

• Subpart: T

• Subpart Title: Commercial Diving Operations

• Standard Number: 1910.402

• Title: Definitions.

As used in this standard, the listed terms are defined as follows:

ACFM: Actual cubic feet per minute.

ASME Code or equivalent: ASME (American Society of Mechanical Engineers) Boiler and Pressure Vessel Code, Section VIII, or an equivalent code which the employer can demonstrate to be equally effective.

ATA: Atmosphere absolute.

Bell: An enclosed compartment, pressurized (closed bell) or unpressurized (open bell), which allows the diver to be transported to and from the underwater work area and which may be used as a temporary refuge during diving operations.

Bottom time: The total elapsed time measured in minutes from the time when the diver leaves the surface in descent to the time that the diver begins ascent.

Bursting pressure: The pressure at which a pressure containment device would fail structurally.

Cylinder: A pressure vessel for the storage of gases.

Decompression chamber: A pressure vessel for human occupancy such as a surface decompression chamber, closed bell, or deep diving system used to decompress divers and to treat decompression sickness.

Decompression sickness: A condition with a variety of symptoms which may result from gas or bubbles in the tissues of divers after pressure reduction.

Decompression table: A profile or set of profiles of depth-time relationships for ascent rates and breathing mixtures to be followed after a specific depth-time exposure or exposures.

Dive-guiding operations means leading groups of sports divers, who use an open-circuit, semi-closed-circuit, or closed-circuit self-contained underwater breathing apparatus, to local undersea diving locations for recreational purposes.

Dive location: A surface or vessel from which a diving operation is conducted.

Dive-location reserve breathing gas: A supply system of air or mixed-gas (as appropriate) at the dive location which is independent of the primary supply system and sufficient to support divers during the planned decompression.

Dive team: Divers and support employees involved in a diving operation, including the designated person-in-charge.

Diver: An employee working in water using underwater apparatus which supplies compressed breathing gas at the ambient pressure.

Diver-carried reserve breathing gas: A diver-carried supply of air or mixed gas (as appropriate) sufficient under standard operating conditions to allow the diver to reach the surface, or another source of breathing gas, or to be reached by a standby diver.

Diving mode: A type of diving requiring specific equipment, procedures and techniques (SCUBA, surface-supplied air, or mixed gas).

FSW: Feet of seawater (or equivalent static pressure head).

Heavy gear: Diver-worn deep-sea dress including helmet, breastplate, dry suit, and weighted shoes.

Hyperbaric conditions: Pressure conditions in excess of surface pressure.

Inwater stage: A suspended underwater platform which supports a diver in the water.

Liveboating: The practice of supporting a surfaced-supplied air or mixed gas diver from a vessel which is underway.

Mixed-gas diving: A diving mode in which the diver is supplied in the water with a breathing gas other than air.

No-decompression limits: The depth-time limits of the "no-decompression limits and repetitive dive group designation table for no-decompression air dives", U.S. Navy Diving Manual or equivalent limits which the employer can demonstrate to be equally effective.

Psi(g): Pounds per square inch (gauge).

Recreational diving instruction means training diving students in the use of recreational diving procedures and the safe operation of diving equipment, including an open-circuit, semi-closed-circuit, or closed-circuit self-contained underwater breathing apparatus, during dives.

Scientific diving means diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific research tasks. Scientific diving does not include performing any tasks usually associated with commercial diving such as: Placing or removing heavy objects underwater; inspection of pipelines and similar objects; construction; demolition; cutting or welding; or the use of explosives.

SCUBA diving: A diving mode independent of surface supply in which the diver uses open circuit self-contained underwater breathing apparatus.

Standby diver: A diver at the dive location available to assist a diver in the water.

Surface-supplied air diving: A diving mode in which the diver in the water is supplied from the dive location with compressed air for breathing.

Treatment table: A depth-time and breathing gas profile designed to treat decompression sickness.

Umbilical: The composite hose bundle between a dive location and a diver or bell, or between a diver and a bell, which supplies the diver or bell with breathing gas, communications, power, or heat as appropriate to the diving mode or conditions, and includes a safety line between the diver and the dive location.

Volume tank: A pressure vessel connected to the outlet of a compressor and used as an air reservoir.

Working pressure: The maximum pressure to which a pressure containment device may be exposed under standard operating conditions.

[42 FR 37668, July 22, 1977, as amended at 47 FR 53365, Nov. 26, 1982; 69 FR 7363, Feb. 17, 2004]

• Part Number: 1910

• Part Title: Occupational Safety and Health Standards

• Subpart: T

• Subpart Title: Commercial Diving Operations

• Standard Number: 1910.410

• Title: Qualifications of dive team.

1910.410(a)

General.

1910.410(a)(1)

Each dive team member shall have the experience or training necessary to perform assigned tasks in a safe and healthful manner.

1910.410(a)(2)

Each dive team member shall have experience or training in the following:

1910.410(a)(2)(i)

The use of tools, equipment and systems relevant to assigned tasks;

1910.410(a)(2)(ii)

Techniques of the assigned diving mode: and

1910.410(a)(2)(iii)

Diving operations and emergency procedures.

1910.410(a)(3)

All dive team members shall be trained in cardiopulmonary resuscitation and first aid (American Red Cross standard course or equivalent).

..1910.410(a)(4)

1910.410(a)(4)

Dive team members who are exposed to or control the exposure of others to hyperbaric conditions shall be trained in diving-related physics and physiology.

1910.410(b)

Assignments.

1910.410(b)(1)

Each dive team member shall be assigned tasks in accordance with the employee's experience or training, except that limited additional tasks may be assigned to an employee undergoing training provided that these tasks are performed under the direct supervision of an experienced dive team member.

1910.410(b)(2)

The employer shall not require a dive team member to be exposed to hyperbaric conditions against the employee's will, except when necessary to complete decompression or treatment procedures.

1910.410(b)(3)

The employer shall not permit a dive team member to dive or be otherwise exposed to hyperbaric conditions for the duration of any temporary physical impairment or condition which is known to the employer and is likely to affect adversely the safety or health of a dive team member.

1910.410(c)

Designated person-in-charge.

1910.410(c)(1)

The employer or an employee designated by the employer shall be at the dive location in charge of all aspects of the diving operation affecting the safety and health of dive team members.

1910.410(c)(2)

The designated person-in-charge shall have experience and training in the conduct of the assigned diving operation.

• Part Number: 1910

• Part Title: Occupational Safety and Health Standards

• Subpart: T

• Subpart Title: Commercial Diving Operations

• Standard Number: 1910.420

• Title: Safe practices manual.

1910.420(a)

General. The employer shall develop and maintain a safe practices manual which shall be made available at the dive location to each dive team member.

1910.420(b)

Contents.

1910.420(b)(1)

The safe practices manual shall contain a copy of this standard and the employer's policies for implementing the requirements of this standard.

1910.420(b)(2)

For each diving mode engaged in, the safe practices manual shall include:

1910.420(b)(2)(i)

Safety procedures and checklists for diving operations;

1910.420(b)(2)(ii)

Assignments and responsibilities of the dive team members;

1910.420(b)(2)(iii)

Equipment procedures and checklists; and

1910.420(b)(2)(iv)

Emergency procedures for fire, equipment failure, adverse environmental conditions, and medical illness and injury.

[42 FR 37668, July 22, 1977, as amended at 49 FR 18295, Apr. 30, 1984; 61 FR 5507, Feb. 13, 1996]

• Part Number: 1910

• Part Title: Occupational Safety and Health Standards

• Subpart: T

• Subpart Title: Commercial Diving Operations

• Standard Number: 1910.421

• Title: Pre-dive procedures.

1910.421(a)

General. The employer shall comply with the following requirements prior to each diving operation, unless otherwise specified.

1910.421(b)

Emergency aid. A list shall be kept at the dive location of the telephone or call numbers of the following:

1910.421(b)(1)

An operational decompression chamber (if not at the dive location);

1910.421(b)(2)

Accessible hospitals;

1910.421(b)(3)

Available physicians;

1910.421(b)(4)

Available means of transportation; and

1910.421(b)(5)

The nearest U.S. Coast Guard Rescue Coordination Center.

1910.421(c)

First aid supplies.

1910.421(c)(1)

A first aid kit appropriate for the diving operation and approved by a physician shall be available at the dive location.

1910.421(c)(2)

1910.421(c)(2)

When used in a decompression chamber or bell, the first aid kit shall be suitable for use under hyperbaric conditions.

1910.421(c)(3)

In addition to any other first aid supplies, an American Red Cross standard first aid handbook or equivalent, and a bag-type manual resuscitator with transparent mask and tubing shall be available at the dive location.

1910.421(d)

Planning and assessment. Planning of a diving operation shall include an assessment of the safety and health aspects of the following:

1910.421(d)(1)

Diving mode;

1910.421(d)(2)

Surface and underwater conditions and hazards;

1910.421(d)(3)

Breathing gas supply (including reserves);

1910.421(d)(4)

Thermal protection;

1910.421(d)(5)

Diving equipment and systems;

1910.421(d)(6)

Dive team assignments and physical fitness of dive team members (including any impairment known to the employer);

1910.421(d)(7)

1910.421(d)(7)

Repetitive dive designation or residual inert gas status of dive team members;

1910.421(d)(8)

Decompression and treatment procedures (including altitude corrections); and

1910.421(d)(9)

Emergency procedures.

1910.421(e)

Hazardous activities. To minimize hazards to the dive team, diving operations shall be coordinated with other activities in the vicinity which are likely to interfere with the diving operation.

1910.421(f)

Employee briefing.

1910.421(f)(1)

Dive team members shall be briefed on:

1910.421(f)(1)(i)

The tasks to be undertaken;

1910.421(f)(1)(ii)

Safety procedures for the diving mode;

1910.421(f)(1)(iii)

Any unusual hazards or environmental conditions likely to affect the safety of the diving operation; and

1910.421(f)(1)(iv)

Any modifications to operating procedures necessitated by the specific diving operation.

..1910.421(f)(2)

1910.421(f)(2)

Prior to making individual dive team member assignments, the employer shall inquire into the dive team member's current state of physical fitness, and indicate to the dive team member the procedure for reporting physical problems or adverse physiological effects during and after the dive.

1910.421(g)

Equipment inspection. The breathing gas supply system including reserve breathing gas supplies, masks, helmets, thermal protection, and bell handling mechanism (when appropriate) shall be inspected prior to each dive.

1910.421(h)

Warning signal. When diving from surfaces other than vessels in areas capable of supporting marine traffic, a rigid replica of the international code flag "A" at least one meter in height shall be displayed at the dive location in a manner which allows all-round visibility, and shall be illuminated during night diving operations.

[42 FR 37668, July 22, 1977, as amended at 47 FR 14706, Apr. 6, 1982; 54 FR 24334, June 7. 1989; 61 FR 5507, Feb. 13, 1996]

- Part Number: 1910
- Part Title: Occupational Safety and Health Standards
- Subpart: T
- Subpart Title: Commercial Diving Operations

• Standard Number: 1910.422

• Title: Procedures during dive.

1910.422(a)

General. The employer shall comply with the following requirements which are applicable to each diving operation unless otherwise specified.

1910.422(b)

Water entry and exit.

1910.422(b)(1)

A means capable of supporting the diver shall be provided for entering and exiting the water.

1910.422(b)(2)

The means provided for exiting the water shall extend below the water surface.

1910.422(b)(3)

A means shall be provided to assist an injured diver from the water or into a bell.

1910.422(c)

Communications.

1910.422(c)(1)

An operational two-way voice communication system shall be used between:

1910.422(c)(1)(i)

Each surface-supplied air or mixed-gas diver and a dive team member at the dive location or bell (when provided or required); and

1910.422(c)(1)(ii)

The bell and the dive location.

..1910.422(c)(2)

1910.422(c)(2)

An operational, two-way communication system shall be available at the dive location to obtain emergency assistance.

1910.422(d)

Decompression tables. Decompression, repetitive, and no-decompression tables (as appropriate) shall be at the dive location.

1910.422(e)

Dive profiles. A depth-time profile, including when appropriate any breathing gas changes, shall be maintained for each diver during the dive including decompression.

1910.422(f)

Hand-held power tools and equipment.

1910.422(f)(1)

Hand-held electrical tools and equipment shall be de-energized before being placed into or retrieved from the water.

1910.422(f)(2)

Hand-held power tools shall not be supplied with power from the dive location until requested by the diver.

1910.422(g)

Welding and burning.

1910.422(g)(1)

A current supply switch to interrupt the current flow to the welding or burning electrode shall be:

1910.422(g)(1)(i)

Tended by a dive team member in voice communication with the diver performing the welding or burning; and

..1910.422(g)(1)(ii)

1910.422(g)(1)(ii)

Kept in the open position except when the diver is welding or burning.

1910.422(g)(2)

The welding machine frame shall be grounded.

1910.422(g)(3)

Welding and burning cables, electrode holders, and connections shall be capable of carrying the maximum current required by the work, and shall be properly insulated.

1910.422(g)(4)

Insulated gloves shall be provided to divers performing welding and burning operations.

1910.422(g)(5)

Prior to welding or burning on closed compartments, structures or pipes, which contain a flammable vapor or in which a flammable vapor may be generated by the work, they shall be vented, flooded, or purged with a mixture of gases which will not support combustion.

1910.422(h)

Explosives.

1910.422(h)(1)

Employers shall transport, store, and use explosives in accordance with this section and the applicable provisions of 1910.109 and 1926.912 of Title 29 of the Code of Federal Regulations.

1910.422(h)(2)

Electrical continuity of explosive circuits shall not be tested until the diver is out of the water.

..1910.422(h)(3)

1910.422(h)(3)

Explosives shall not be detonated while the diver is in the water.

1910.422(i)

Termination of dive. The working interval of a dive shall be terminated when:

1910.422(i)(1)

A diver requests termination;

1910.422(i)(2)

A diver fails to respond correctly to communications or signals from a dive team member;

1910.422(i)(3)

Communications are lost and can not be quickly re-established between the diver and a dive team member at the dive location, and between the designated person-in-charge and the person controlling the vessel in liveboating operations; or

1910.422(i)(4)

A diver begins to use diver-carried reserve breathing gas or the dive-location reserve breathing gas.

• Part Number: 1910

• Part Title: Occupational Safety and Health Standards

• Subpart: T

• Subpart Title: Commercial Diving Operations

• Standard Number: 1910.423

• Title: Post-dive procedures.

1910.423(a)

General. The employer shall comply with the following requirements which are applicable after each diving operation, unless otherwise specified.

1910.423(b)

Precautions.

1910.423(b)(1)

After the completion of any dive, the employer shall:

1910.423(b)(1)(i)

Check the physical condition of the diver;

1910.423(b)(1)(ii)

Instruct the diver to report any physical problems or adverse physiological effects including symptoms of decompression sickness;

1910.423(b)(1)(iii)

Advise the diver of the location of a decompression chamber which is ready for use; and

1910.423(b)(1)(iv)

Alert the diver to the potential hazards of flying after diving.

..1910.423(b)(2)

1910.423(b)(2)

For any dive outside the no-decompression limits, deeper than 100 fsw or using mixed gas as a breathing mixture, the employer shall instruct the diver to remain awake and in the vicinity of the decompression chamber which is at the dive location for at least one hour after the dive (including decompression or treatment as appropriate).

1910.423(c)

Recompression capability.

1910.423(c)(1)

A decompression chamber capable of recompressing the diver at the surface to a minimum of 165 fsw (6 ATA) shall be available at the dive location for:

1910.423(c)(1)(i)

Surface-supplied air diving to depths deeper than 100 fsw and shallower than 220 fsw;

1910.423(c)(1)(ii)

Mixed gas diving shallower than 300 fsw; or

1910.423(c)(1)(iii)

Diving outside the no-decompression limits shallower than 300 fsw.

1910.423(c)(2)

A decompression chamber capable of recompressing the diver at the surface to the maximum depth of the dive shall be available at the dive location for dives deeper than 300 fsw.

1910.423(c)(3)

The decompression chamber shall be:

1910.423(c)(3)(i)

Dual-lock;

1910.423(c)(3)(ii)

Multiplace; and

1910.423(c)(3)(iii)

Located within 5 minutes of the dive location.

..1910.423(c)(4)

1910.423(c)(4)

The decompression chamber shall be equipped with:

1910.423(c)(4)(i)

A pressure gauge for each pressurized compartment designed for human occupancy;

1910.423(c)(4)(ii)

A built-in-breathing-system with a minimum of one mask per occupant;

1910.423(c)(4)(iii)

A two-way voice communication system between occupants and a dive team member at the dive location;

1910.423(c)(4)(iv)

A viewport; and

1910.423(c)(4)(v)

Illumination capability to light the interior.

1910.423(c)(5)

Treatment tables, treatment gas appropriate to the diving mode, and sufficient gas to conduct treatment shall be available at the dive location.

1910.423(c)(6)

A dive team member shall be available at the dive location during and for at least one hour after the dive to operate the decompression chamber (when required or provided).

..1910.423(d)

1910.423(d)

Record of dive.

1910.423(d)(1)

The following information shall be recorded and maintained for each diving operation:

1910.423(d)(1)(i)

Names of dive team members including designated person-in-charge;

1910.423(d)(1)(ii)

Date, time, and location;

1910.423(d)(1)(iii)

Diving modes used;

1910.423(d)(1)(iv)

General nature of work performed;

1910.423(d)(1)(v)

Approximate underwater and surface conditions (visibility, water temperature and current); and

1910.423(d)(1)(vi)

Maximum depth and bottom time for each diver.

1910.423(d)(2)

For each dive outside the no-decompression limits, deeper than 100 fsw or using mixed gas, the following additional information shall be recorded and maintained:

1910.423(d)(2)(i)

Depth-time and breathing gas profiles;

1910.423(d)(2)(ii)

Decompression table designation (including modification); and

..1910.423(d)(2)(iii)

1910.423(d)(2)(iii)

Elapsed time since last pressure exposure if less than 24 hours or repetitive dive designation for each diver.

1910.423(d)(3)

For each dive in which decompression sickness is suspected or symptoms are evident, the following additional information shall be recorded and maintained:

1910.423(d)(3)(i)

Description of decompression sickness symptoms (including depth and time of onset); and

1910.423(d)(3)(ii)

Description and results of treatment.

1910.423(e)

Decompression procedure assessment. The employer shall:

1910.423(e)(1)

Investigate and evaluate each incident of decompression sickness based on the recorded information, consideration of the past performance of decompression table used, and individual susceptibility;

1910.423(e)(2)

Take appropriate corrective action to reduce the probability of recurrence of decompression sickness; and

1910.423(e)(3)

Prepare a written evaluation of the decompression procedure assessment, including any corrective action taken, within 45 days of the incident of decompression sickness.

[42 FR 37668, July 22, 1977, as amended at 49 FR 18295, Apr. 30, 1984; 61 FR 5507, Feb. 13, 1996]

- Part Number: 1910
- Part Title: Occupational Safety and Health Standards
- Subpart: T
- Subpart Title: Commercial Diving Operations
- Standard Number: 1910.424

• Title: SCUBA diving.

1910.424(a)

General. Employers engaged in SCUBA diving shall comply with the following requirements, unless otherwise specified.

1910.424(b)

Limits. SCUBA diving shall not be conducted:

1910.424(b)(1)

At depths deeper than 130 fsw;

1910.424(b)(2)

At depths deeper than 100 fsw or outside the no-decompression limits unless a decompression chamber is ready for use;

1910.424(b)(3)

Against currents exceeding one (1) knot unless line-tended; or

1910.424(b)(4)

In enclosed or physically confining spaces unless line-tended.

1910.424(c)

Procedures.

1910.424(c)(1)

A standby diver shall be available while a diver is in the water.

1910.424(c)(2)

A diver shall be line-tended from the surface, or accompanied by another diver in the water in continuous visual contact during the diving operations.

..1910.424(c)(3)

1910.424(c)(3)

A diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.

1910.424(c)(4)

A diver-carried reserve breathing gas supply shall be provided for each diver consisting of:

1910.424(c)(4)(i)

A manual reserve (J valve); or

1910.424(c)(4)(ii)

An independent reserve cylinder with a separate regulator or connected to the underwater breathing apparatus.

1910.424(c)(5)

The valve of the reserve breathing gas supply shall be in the closed position prior to the dive.

• Part Number: 1910

• Part Title: Occupational Safety and Health Standards

• Subpart: T

• Subpart Title: Commercial Diving Operations

• Standard Number: 1910.425

• Title: Surface-supplied air diving.

1910.425(a)

General. Employers engaged in surface-supplied air diving shall comply with the following requirements, unless otherwise specified.

1910.425(b)

Limits.

1910.425(b)(1)

Surface-supplied air diving shall not be conducted at depths deeper than 190 fsw, except that dives with bottom times of 30 minutes or less may be conducted to depths of 220 fsw.

1910.425(b)(2)

A decompression chamber shall be ready for use at the dive location for any dive outside the no-decompression limits or deeper than 100 fsw.

1910.425(b)(3)

A bell shall be used for dives with an inwater decompression time greater than 120 minutes, except when heavy gear is worn or diving is conducted in physically confining spaces.

1910.425(c)

Procedures.

1910.425(c)(1)

Each diver shall be continuously tended while in the water.

..1910.425(c)(2)

1910.425(c)(2)

A diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.

1910.425(c)(3)

Each diving operation shall have a primary breathing gas supply sufficient to support divers for the duration of the planned dive including decompression.

1910.425(c)(4)

For dives deeper than 100 fsw or outside the no-decompression limits:

1910.425(c)(4)(i)

A separate dive team member shall tend each diver in the water;

1910.425(c)(4)(ii)

A standby diver shall be available while a diver is in the water;

1910.425(c)(4)(iii)

A diver-carried reserve breathing gas supply shall be provided for each diver except when heavy gear is worn; and

1910.425(c)(4)(iv)

A dive-location reserve breathing gas supply shall be provided.

1910.425(c)(5)

For heavy-gear diving deeper than 100 fsw or outside the no-decompression limits:

1910.425(c)(5)(i)

An extra breathing gas hose capable of supplying breathing gas to the diver in the water shall be available to the standby diver.

..1910.425(c)(5)(ii)

1910.425(c)(5)(ii)

An inwater stage shall be provided to divers in the water.

1910.425(c)(6)

Except when heavy gear is worn or where physical space does not permit, a diver-carried reserve breathing gas supply shall be provided whenever the diver is prevented by the configuration of the dive area from ascending directly to the surface.

• Part Number: 1910

• Part Title: Occupational Safety and Health Standards

• Subpart: T

• Subpart Title: Commercial Diving Operations

• Standard Number: 1910.426

• Title: Mixed-gas diving.

1910.426(a)

General. Employers engaged in mixed-gas diving shall comply with the following requirements, unless otherwise specified.

1910.426(b)

Limits. Mixed-gas diving shall be conducted only when:

1910.426(b)(1)

A decompression chamber is ready for use at the dive location; and

1910.426(b)(1)(i)

A bell is used at depths greater than 220 fsw or when the dive involves inwater decompression time of greater than 120 minutes, except when heavy gear is worn or when diving in physically confining spaces; or

1910.426(b)(1)(ii)

A closed bell is used at depths greater than 300 fsw, except when diving is conducted in physically confining spaces.

1910.426(c)

Procedures.

1910.426(c)(1)

A separate dive team member shall tend each diver in the water.

1910.426(c)(2)

A standby diver shall be available while a diver is in the water.

..1910.426(c)(3)

1910.426(c)(3)

A diver shall be stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces.

1910.426(c)(4)

Each diving operation shall have a primary breathing gas supply sufficient to support divers for the duration of the planned dive including decompression.

1910.426(c)(5)

Each diving operation shall have a dive-location reserve breathing gas supply.

1910.426(c)(6)

When heavy gear is worn:

1910.426(c)(6)(i)

An extra breathing gas hose capable of supplying breathing gas to the diver in the water shall be available to the standby diver; and

1910.426(c)(6)(ii)

An inwater stage shall be provided to divers in the water.

1910.426(c)(7)

An inwater stage shall be provided for divers without access to a bell for dives deeper than 100 fsw or outside the no-decompression limits.

1910.426(c)(8)

When a closed bell is used, one dive team member in the bell shall be available and tend the diver in the water.

..1910.426(c)(9)

1910.426(c)(9)

Except when heavy gear is worn or where physical space does not permit, a diver-carried reserve breathing gas supply shall be provided for each diver:

1910.426(c)(9)(i)

Diving deeper than 100 fsw or outside the no-decompression limits; or

1910.426(c)(9)(ii)

Prevented by the configuration of the dive area from directly ascending to the surface.

• Part Number: 1910

• Part Title: Occupational Safety and Health Standards

• Subpart: T

• Subpart Title: Commercial Diving Operations

• Standard Number: 1910.427

• Title: Liveboating.

1910.427(a)

General. Employers engaged in diving operations involving liveboating shall comply with the following requirements.

1910.427(b)

Limits. Diving operations involving liveboating shall not be conducted:

1910.427(b)(1)

With an inwater decompression time of greater than 120 minutes;

1910.427(b)(2)

Using surface-supplied air at depths deeper than 190 fsw, except that dives with bottom times of 30 minutes or less may be conducted to depths of 220 fsw;

1910.427(b)(3)

Using mixed gas at depths greater than 220 fsw;

1910.427(b)(4)

In rough seas which significantly impede diver mobility or work function; or

1910.427(b)(5)

In other than daylight hours.

1910.427(c)

Procedures.

1910.427(c)(1)

The propeller of the vessel shall be stopped before the diver enters or exits the water.

..1910.427(c)(2)

1910.427(c)(2)

A device shall be used which minimizes the possibility of entanglement of the diver's hose in the propeller of the vessel.

1910.427(c)(3)

Two-way voice communication between the designated person-in-charge and the person controlling the vessel shall be available while the diver is in the water.

1910.427(c)(4)

A standby diver shall be available while a diver is in the water.

1910.427(c)(5)

A diver-carried reserve breathing gas supply shall be carried by each diver engaged in liveboating operations.

• Part Number: 1910

• Part Title: Occupational Safety and Health Standards

• Subpart: T

• Subpart Title: Commercial Diving Operations

• Standard Number: 1910.430

• Title: Equipment.

1910.430(a)

General.

1910.430(a)(1)

All employers shall comply with the following requirements, unless otherwise specified.

1910.430(a)(2)

Each equipment modification, repair, test, calibration or maintenance service shall be recorded by means of a tagging or logging system, and include the date and nature of work performed, and the name or initials of the person performing the work.

1910.430(b)

Air compressor system.

1910.430(b)(1)

Compressors used to supply air to the diver shall be equipped with a volume tank with a check valve on the inlet side, a pressure gauge, a relief valve, and a drain valve.

1910.430(b)(2)

Air compressor intakes shall be located away from areas containing exhaust or other contaminants.

1910.430(b)(3)

Respirable air supplied to a diver shall not contain:

1910.430(b)(3)(i)

A level of carbon monoxide (CO) greater than 20 p/m;

1910.430(b)(3)(ii)

A level of carbon dioxide (CO(2)) greater than 1,000 p/m;

..1910.430(b)(3)(iii)

1910.430(b)(3)(iii)

A level of oil mist greater than 5 milligrams per cubic meter; or

1910.430(b)(3)(iv)

A noxious or pronounced odor.

1910.430(b)(4)

The output of air compressor systems shall be tested for air purity every 6 months by means of samples taken at the connection to the distribution system, except that non-oil lubricated compressors need not be tested for oil mist.

1910.430(c)

Breathing gas supply hoses.

1910.430(c)(1)

Breathing gas supply hoses shall:

1910.430(c)(1)(i)

Have a working pressure at least equal to the working pressure of the total breathing gas system;

1910.430(c)(1)(ii)

Have a rated bursting pressure at least equal to 4 times the working pressure;

1910.430(c)(1)(iii)

Be tested at least annually to 1.5 times their working pressure; and

1910.430(c)(1)(iv)

Have their open ends taped, capped or plugged when not in use.

1910.430(c)(2)

Breathing gas supply hose connectors shall:

..1910.430(c)(2)(i)

1910.430(c)(2)(i)

Be made of corrosion-resistant materials;

1910.430(c)(2)(ii)

Have a working pressure at least equal to the working pressure of the hose to which they are attached; and

1910.430(c)(2)(iii)

Be resistant to accidental disengagement.

1910.430(c)(3)

Umbilicals shall:

1910.430(c)(3)(i)

Be marked in 10-ft. increments to 100 feet beginning at the diver's end, and in 50 ft. increments thereafter;

1910.430(c)(3)(ii)

Be made of kink-resistant materials; and

1910.430(c)(3)(iii)

Have a working pressure greater than the pressure equivalent to the maximum depth of the dive (relative to the supply source) plus 100 psi.

1910.430(d)

Buoyancy control.

1910.430(d)(1)

Helmets or masks connected directly to the dry suit or other buoyancy-changing equipment shall be equipped with an exhaust valve.

..1910.430(d)(2)

1910.430(d)(2)

A dry suit or other buoyancy-changing equipment not directly connected to the helmet or mask shall be equipped with an exhaust valve.

1910.430(d)(3)

When used for SCUBA diving, a buoyancy compensator shall have an inflation source separate from the breathing gas supply.

1910.430(d)(4)

An inflatable flotation device capable of maintaining the diver at the surface in a face-up position, having a manually activated inflation source independent of the breathing supply, an oral inflation device, and an exhaust valve shall be used for SCUBA diving.

1910.430(e)

Compressed gas cylinders. Compressed gas cylinders shall:

1910.430(e)(1)

Be designed, constructed and maintained in accordance with the applicable provisions of 29 CFR 1910.101 and 1910.169 through 1910.171.

1910.430(e)(2)

Be stored in a ventilated area and protected from excessive heat;

1910.430(e)(3)

Be secured from falling; and

..1910.430(e)(4)

1910.430(e)(4)

Have shut-off valves recessed into the cylinder or protected by a cap, except when in use or manifolded, or when used for SCUBA diving.

1910.430(f)

Decompression chambers.

1910.430(f)(1)

Each decompression chamber manufactured after the effective date of this standard, shall be built and maintained in accordance with the ASME Code or equivalent.

1910.430(f)(2)

Each decompression chamber manufactured prior to the effective date of this standard shall be maintained in conformity with the code requirements to which it was built, or equivalent.

1910.430(f)(3)

Each decompression chamber shall be equipped with:

1910.430(f)(3)(i)

Means to maintain the atmosphere below a level of 25 percent oxygen by volume;

1910.430(f)(3)(ii)

Mufflers on intake and exhaust lines, which shall be regularly inspected and maintained;

1910.430(f)(3)(iii)

Suction guards on exhaust line openings; and

1910.430(f)(3)(iv)

A means for extinguishing fire, and shall be maintained to minimize sources of ignition and combustible material.

..1910.430(g)

1910.430(g)

Gauges and timekeeping devices.

1910.430(g)(1)

Gauges indicating diver depth which can be read at the dive location shall be used for all dives except SCUBA.

1910.430(g)(2)

Each depth gauge shall be deadweight tested or calibrated against a master reference gauge every 6 months, and when there is a discrepancy greater than two percent (2 percent) of full scale between any two equivalent gauges.

1910.430(g)(3)

A cylinder pressure gauge capable of being monitored by the diver during the dive shall be worn by each SCUBA diver.

1910.430(g)(4)

A timekeeping device shall be available at each dive location.

1910.430(h)

Masks and helmets.

1910.430(h)(1)

Surface-supplied air and mixed-gas masks and helmets shall have:

1910.430(h)(1)(i)

A non-return valve at the attachment point between helmet or mask and hose which shall close readily and positively; and

1910.430(h)(1)(ii)

An exhaust valve.

..1910.430(h)(2)

1910.430(h)(2)

Surface-supplied air masks and helmets shall have a minimum ventilation rate capability of 4.5 acfm at any depth at which they are operated or the capability of maintaining the diver's inspired carbon dioxide partial pressure below 0.02 ATA when the diver is producing carbon dioxide at the rate of 1.6 standard liters per minute.

1910.430(i)

Oxygen safety.

1910.430(i)(1)

Equipment used with oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be designed for oxygen service.

1910.430(i)(2)

Components (except umbilicals) exposed to oxygen or mixtures containing over forty percent (40%) by volume oxygen shall be cleaned of flammable materials before use.

1910.430(i)(3)

Oxygen systems over 125 psig and compressed air systems over 500 psig shall have slow-opening shut-off valves.

1910.430(j)

Weights and harnesses.

1910.430(j)(1)

Except when heavy gear is worn, divers shall be equipped with a weight belt or assembly capable of quick release.

1910.430(j)(2)

Except when heavy gear is worn or in SCUBA diving, each diver shall wear a safety harness with:

1910.430(j)(2)(i)

A positive buckling device;

1910.430(j)(2)(ii)

An attachment point for the umbilical to prevent strain on the mask or helmet; and

..1910.430(j)(2)(iii)

1910.430(j)(2)(iii)

A lifting point to distribute the pull force of the line over the diver's body.

[39 FR 23502, June 27, 1974, as amended at 49 FR 18295, Apr. 30, 1984; 51 FR 33033, Sept. 18, 1986; 61 FR 5507, Feb. 13, 1996]

• Part Number: 1910

• Part Title: Occupational Safety and Health Standards

• Subpart: T

• Subpart Title: Commercial Diving Operations

• Standard Number: 1910.440

• Title: Recordkeeping requirements.

1910.440(a)(1)

[Reserved]

1910.440(a)(2)

The employer shall record the occurrence of any diving-related injury or illness which requires any dive team member to be hospitalized for 24 hours or more, specifying the circumstances of the incident and the extent of any injuries or illnesses.

1910.440(b)

Availability of records.

1910.440(b)(1)

Upon the request of the Assistant Secretary of Labor for Occupational Safety and Health, or the Director, National Institute for Occupational Safety and Health, Department of Health and Human Services of their designees, the employer shall make available for inspection and copying any record or document required by this standard.

1910.440(b)(2)

Records and documents required by this standard shall be provided upon request to employees, designated representatives, and the Assistant Secretary in accordance with 29 CFR 1910.1020 (a)-(e) and (g)-

1910.440(b)(2)(i)

Safe practices manuals (1910.420), depth-time profiles (1910.422), recordings of dives (1910.423), decompression procedure assessment evaluations (1910.423), and records of hospitalizations (1910.440) shall be provided in the same manner as employee exposure records or analyses using exposure or medical records. Equipment inspections and testing records which pertain to employees (1910.430) shall also be provided upon request to employees and their designated representatives.

1910.440(b)(3)

Records and documents required by this standard shall be retained by the employer for the following period:

1910.440(b)(3)(i)

Dive team member medical records (physician's reports) (1910.411) - 5 years;

1910.440(b)(3)(ii)

Safe practices manual (1910.420) - current document only;

1910.440(b)(3)(iii)

Depth-time profile (1910.422) - until completion of the recording of dive, or until completion of decompression procedure assessment where there has been an incident of decompression sickness;

1910.440(b)(3)(iv)

Recording of dive (1910.423) - 1 year, except 5 years where there has been an incident of decompression sickness;

1910.440(b)(3)(v)

Decompression procedure assessment evaluations (1910.423) - 5 years;

1910.440(b)(3)(vi)

Equipment inspections and testing records (1910.430) - current entry or tag, or until equipment is withdrawn from service;

1910.440(b)(3)(vii)

Records of hospitalizations (1910.440) - 5 years.

1910.440(b)(4)

After the expiration of the retention period of any record required to be kept for five (5) years, the employer shall forward such records to the National Institute for Occupational Safety and Health, Department of Health and Human Services. The employer shall also comply with any additional requirements set forth at 29 CFR 1910.20(h).

1910.440(b)(5)

In the event the employer ceases to do business:

1910.440(b)(5)(i)

The successor employer shall receive and retain all dive and employee medical records required by this standard; or

1910.440(b)(5)(ii)

If there is no successor employer, dive and employee medical records shall be forwarded to the National Institute for Occupational Safety and Health, Department of Health and Human Services.

[42 FR 37668, July 22, 1977, as amended at 45 FR 35281, May 23, 1980; 47 FR 14706, Apr. 6, 1982; 51 FR 34562, Sept. 29, 1986; 61 FR 5507, Feb. 13, 1996; 61 FR 9227, March 7, 1996; 71 FR 16672, April 3, 2006]

• Part Number: 1910

• Part Title: Occupational Safety and Health Standards

• Subpart: T

• Subpart Title: Commercial Diving Operations

• Standard Number: 1910 Subpart T App A

• Title: Examples of conditions which may restrict or limit exposure to hyperbaric conditions

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Appendix A to 1910 Subpart T - Examples of conditions which may restrict or limit exposure to hyperbaric conditions

The following disorders may restrict or limit occupational exposure to hyperbaric conditions depending on severity, presence of residual effects, response to therapy, number of occurrences, diving mode, or degree and duration of isolation.

History of seizure disorder other than early febrile convulsions.

Malignancies (active) unless treated and without recurrence for

5 yrs.

Chronic inability to equalize sinus and/or middle ear pressure.

Cystic or cavitary disease of the lungs.

Impaired organ function caused by alcohol or drug use.

Conditions requiring continuous medication for control (e.g.,

antihistamines, steroids, barbiturates, moodaltering drugs,

or insulin).

Meniere's disease.

Hemoglobinopathies.

Obstructive or restrictive lung disease.

Vestibular end organ destruction.

Pneumothorax.

Cardiac abnormalities (e.g., pathological heart block, valvular

disease, intraventricular conduction defects other than isolated

right bundle branch block, angina pectoris, arrhythmia, coronary

artery disease).

Juxta-articular osteonecrosis.

• Part Number: 1910

• Part Title: Occupational Safety and Health Standards

• Subpart: T

• Subpart Title: Commercial Diving Operations

• Standard Number: 1910 Subpart T App B

• Title: Guidelines for scientific diving

This appendix contains guidelines that will be used in conjunction with 1910.401(a)(2)(iv) to determine those scientific diving programs which are exempt from the requirements for commercial diving. The guidelines are as follows:

1. The Diving Control Board consists of a majority of active scientific divers and has autonomous and absolute authority over the scientific diving program's operations.

2. The purpose of the project using scientific diving is the advancement of science; therefore, information and data resulting from the project are non-proprietary.

3. The tasks of a scientific diver are those of an observer and data gatherer. Construction and trouble-shooting tasks traditionally associated with commercial diving are not included within scientific diving.

4. Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and, therefore, are scientists or scientists in training.

[50 FR 1050, Jan. 9, 1985]

• Part Number: 1910

• Part Title: Occupational Safety and Health Standards

• Subpart: T

• Subpart Title: Commercial Diving Operations

• Standard Number: 1910 Subpart T App C

• Title: Alternative Conditions Under 1910.401(a)(3) for Recreational Diving Instructors and Diving Guides (Mandatory)

Appendix C to Subpart T of Part 1910 -- Alternative Conditions Under § 1910.401(a)(3) for Recreational Diving Instructors and Diving Guides (Mandatory)

Paragraph (a)(3) of § 1910.401 specifies that an employer of recreational diving instructors and diving guides (hereafter, "divers" or "employees") who complies with all of the conditions of this appendix need not provide a decompression chamber for these divers as required under §§ 1910.423(b)(2) or (c)(3) or 1910.426(b)(1).

1. Equipment Requirements for Rebreathers

(a) The employer must ensure that each employee operates the rebreather (i.e., semi-closed-circuit and closed-circuit self-contained underwater breathing apparatuses (hereafter, "SCUBAs")) according to the rebreather manufacturer's instructions.

(b) The employer must ensure that each rebreather has a counterlung that supplies a sufficient volume of breathing gas to their divers to sustain the divers' respiration rates, and contains a baffle system and/or other moisture separating system that keeps moisture from entering the scrubber.

(c) The employer must place a moisture trap in the breathing loop of the rebreather, and ensure that:

(i) The rebreather manufacturer approves both the moisture trap and its location in the breathing loop; and

(ii) Each employee uses the moisture trap according to the rebreather manufacturer's instructions.

(d) The employer must ensure that each rebreather has a continuously functioning moisture sensor, and that:

(i) The moisture sensor connects to a visual (e.g., digital, graphic, analog) or auditory (e.g., voice, pure tone) alarm that is readily detectable by the diver under the diving conditions in which the diver operates, and warns the diver of moisture in the breathing loop in sufficient time to terminate the dive and return safely to the surface; and

(ii) Each diver uses the moisture sensor according to the rebreather manufacturer's instructions.

(e) The employer must ensure that each rebreather contains a continuously functioning CO2 sensor in the breathing loop, and that:

(i) The rebreather manufacturer approves the location of the CO2 sensor in the breathing loop;

(ii) The CO2 sensor is integrated with an alarm that operates in a visual (e.g., digital, graphic, analog) or auditory (e.g., voice, pure tone) mode that is readily detectable by each diver under the diving conditions in which the diver operates; and

(iii) The CO2 alarm remains continuously activated when the inhaled CO2 level reaches and exceeds 0.005 atmospheres absolute (ATA).

(f) Before each day's diving operations, and more often when necessary, the employer must calibrate the CO2 sensor according to the sensor manufacturer's instructions, and ensure that:

(i) The equipment and procedures used to perform this calibration are accurate to within 10% of a CO2 concentration of 0.005 ATA or less;

(ii) The equipment and procedures maintain this accuracy as required by the sensor manufacturer's instructions; and

(iii) The calibration of the CO2 sensor is accurate to within 10% of a CO2 concentration of 0.005 ATA or less.

(g) The employer must replace the CO2 sensor when it fails to meet the accuracy requirements specified in paragraph 1(f)(iii) of this appendix, and ensure that the replacement CO2 sensor meets the accuracy requirements specified in paragraph 1(f)(iii) of this appendix before placing the rebreather in operation.

(h) As an alternative to using a continuously functioning CO_2 sensor, the employer may use a schedule for replacing CO_2-sorbent material provided by the rebreather manufacturer. The employer may use such a schedule only when the rebreather manufacturer has developed it according to the canister- testing protocol specified below in Condition 11, and must use the canister within the temperature range for which the manufacturer conducted its scrubber canister tests following that protocol. Variations above or below the range are acceptable only after the manufacturer adds that lower or higher temperature to the protocol.

(i) When using CO_2-sorbent replacement schedules, the employer must ensure that each rebreather uses a manufactured (i.e., commercially pre-packed), disposable scrubber cartridge containing a CO_2-sorbent material that:

(i) Is approved by the rebreather manufacturer;

(ii) Removes CO_2 from the diver's exhaled gas; and

(iii) Maintains the CO_2 level in the breathable gas (i.e., the gas that a diver inhales directly from the regulator) below a partial pressure of 0.01 ATA.

(j) As an alternative to manufactured, disposable scrubber cartridges, the employer may fill CO_2 scrubber cartridges manually with CO_2-sorbent material when:

(i) The rebreather manufacturer permits manual filling of scrubber cartridges;

(ii) The employer fills the scrubber cartridges according to the rebreather manufacturer's instructions;

(iii) The employer replaces the CO_2-sorbent material using a replacement schedule developed under paragraph 1(h) of this appendix; and

(iv) The employer demonstrates that manual filling meets the requirements specified in paragraph 1(i) of this appendix.

(k) The employer must ensure that each rebreather has an information module that provides:

(i) A visual (e.g., digital, graphic, analog) or auditory (e.g., voice, pure tone) display that effectively warns the diver of solenoid failure (when the rebreather uses solenoids) and other electrical weaknesses or failures (e.g., low battery voltage);

(ii) For a semi-closed circuit rebreather, a visual display for the partial pressure of CO_2, or deviations above and below a preset CO_2 partial pressure of 0.005 ATA; and

(iii) For a closed-circuit rebreather, a visual display for: partial pressures of O_2 and CO_2, or deviations above and below a preset CO_2 partial pressure of 0.005 ATA and a preset O_2 partial pressure of 1.40 ATA or lower; gas temperature in the breathing loop; and water temperature.

(l) Before each day's diving operations, and more often when necessary, the employer must ensure that the electrical power supply and electrical and electronic circuits in each rebreather are operating as required by the rebreather manufacturer's instructions.

2. Special Requirements for Closed-Circuit Rebreathers

(a) The employer must ensure that each closed-circuit rebreather uses supply-pressure sensors for the O_2 and diluent (i.e., air or nitrogen) gases and continuously functioning sensors for detecting temperature in the inhalation side of the gas-loop and the ambient water.

(b) The employer must ensure that:

(i) At least two O2 sensors are located in the inhalation side of the breathing loop; and

(ii) The O2 sensors are: functioning continuously; temperature compensated; and approved by the rebreather manufacturer.

(c) Before each day's diving operations, and more often when necessary, the employer must calibrate O2 sensors as required by the sensor manufacturer's instructions. In doing so, the employer must:

(i) Ensure that the equipment and procedures used to perform the calibration are accurate to within 1% of the O2 fraction by volume;

(ii) Maintain this accuracy as required by the manufacturer of the calibration equipment;

(iii) Ensure that the sensors are accurate to within 1% of the O2 fraction by volume;

(iv) Replace O2 sensors when they fail to meet the accuracy requirements specified in paragraph 2(c)(iii) of this appendix; and

(v) Ensure that the replacement O2 sensors meet the accuracy requirements specified in paragraph 2(c)(iii) of this appendix before placing a rebreather in operation.

(d) The employer must ensure that each closed-circuit rebreather has:

(i) A gas-controller package with electrically operated solenoid O2-supply valves;

(ii) A pressure-activated regulator with a second-stage diluent-gas addition valve;

(iii) A manually operated gas-supply bypass valve to add O2 or diluent gas to the breathing loop; and

(iv) Separate O2 and diluent-gas cylinders to supply the breathing-gas mixture.

3. O2 Concentration in the Breathing Gas

The employer must ensure that the fraction of O2 in the nitrox breathing-gas mixture:

(a) Is greater than the fraction of O2 in compressed air (i.e., exceeds 22% by volume);

(b) For open-circuit SCUBA, never exceeds a maximum fraction of breathable O2 of 40% by volume or a maximum O2 partial pressure of 1.40 ATA, whichever exposes divers to less O2; and

(c) For a rebreather, never exceeds a maximum O2 partial pressure of 1.40 ATA.

4. Regulating O2 Exposures and Diving Depth

(a) Regarding O2 exposure, the employer must:

(i) Ensure that the exposure of each diver to partial pressures of O2 between 0.60 and 1.40 ATA does not exceed the 24-hour single-exposure time limits specified either by the 2001 National Oceanic and Atmospheric Administration Diving Manual (the "2001 NOAA Diving Manual"), or by the report entitled "Enriched Air Operations and Resource Guide" published in 1995 by the Professional Association of Diving Instructors (known commonly as the "1995 DSAT Oxygen Exposure Table"); and

(ii) Determine a diver's O2-exposure duration using the diver's maximum O2 exposure (partial pressure of O2) during the dive and the total dive time (i.e., from the time the diver leaves the surface until the diver returns to the surface).

(b) Regardless of the diving equipment used, the employer must ensure that no diver exceeds a depth of 130 feet of sea water ("fsw") or a maximum O2 partial pressure of 1.40 ATA, whichever exposes the diver to less O2.

5. Use of No-Decompression Limits

(a) For diving conducted while using nitrox breathing-gas mixtures, the employer must ensure that each diver remains within the no-decompression limits specified for single and repetitive air diving and published in the 2001 NOAA Diving Manual or the report entitled "Development and Validation of No-Stop Decompression Procedures for Recreational Diving: The DSAT Recreational Dive Planner," published in 1994 by Hamilton Research Ltd. (known commonly as the "1994 DSAT No-Decompression Tables").

(b) An employer may permit a diver to use a dive-decompression computer designed to regulate decompression when the dive- decompression computer uses the no-decompression limits specified in paragraph 5(a) of this appendix, and provides output that reliably represents those limits.

6. Mixing and Analyzing the Breathing Gas

(a) The employer must ensure that:

(i) Properly trained personnel mix nitrox-breathing gases, and that nitrogen is the only inert gas used in the breathing-gas mixture; and

(ii) When mixing nitrox-breathing gases, they mix the appropriate breathing gas before delivering the mixture to the breathing-gas cylinders, using the continuous-flow or partial-pressure mixing techniques specified in the 2001 NOAA Diving Manual, or using a filter-membrane system.

(b) Before the start of each day's diving operations, the employer must determine the O2 fraction of the breathing-gas mixture using an O2 analyzer. In doing so, the employer must:

(i) Ensure that the O2 analyzer is accurate to within 1% of the O2 fraction by volume.

(ii) Maintain this accuracy as required by the manufacturer of the analyzer.

(c) When the breathing gas is a commercially supplied nitrox breathing-gas mixture, the employer must ensure that the O2 meets the medical USP specifications (Type I, Quality Verification Level A) or aviator's breathing-oxygen specifications (Type I, Quality Verification Level E) of CGA G-4.3-2000 ("Commodity Specification for Oxygen"). In addition, the commercial supplier must:

(i) Determine the O2 fraction in the breathing-gas mixture using an analytic method that is accurate to within 1% of the O2 fraction by volume;

(ii) Make this determination when the mixture is in the charged tank and after disconnecting the charged tank from the charging apparatus;

(iii) Include documentation of the O2-analysis procedures and the O2 fraction when delivering the charged tanks to the employer.

(d) Before producing nitrox breathing-gas mixtures using a compressor in which the gas pressure in any system component exceeds 125 pounds per square inch (psi), the:

(i) Compressor manufacturer must provide the employer with documentation that the compressor is suitable for mixing high- pressure air with the highest O2 fraction used in the nitrox breathing-gas mixture when operated according to the manufacturer's operating and maintenance specifications;

(ii) Employer must comply with paragraph 6(e) of this appendix, unless the compressor is rated for O2 service and is oil- less or oil-free; and

(iii) Employer must ensure that the compressor meets the requirements specified in paragraphs (i)(1) and (i)(2) of § 1910.430 whenever the highest O2 fraction used in the mixing process exceeds 40%.

(e) Before producing nitrox breathing-gas mixtures using an oil- lubricated compressor to mix high-pressure air with O2, and regardless of the gas pressure in any system component, the:

(i) Employer must use only uncontaminated air (i.e., air containing no hydrocarbon particulates) for the nitrox breathing-gas mixture;

(ii) Compressor manufacturer must provide the employer with documentation that the compressor is suitable for mixing the high- pressure air with the highest O2 fraction used in the nitrox breathing-gas mixture when operated according to the manufacturer's operating and maintenance specifications;

(iii) Employer must filter the high-pressure air to produce O2-compatible air;

(iv) The filter-system manufacturer must provide the employer with documentation that the filter system used for this purpose is suitable for producing O2-compatible air when operated according to the manufacturer's operating and maintenance specifications; and

(v) Employer must continuously monitor the air downstream from the filter for hydrocarbon contamination.

(f) The employer must ensure that diving equipment using nitrox breathing-gas mixtures or pure O2 under high pressure (i.e., exceeding 125 psi) conforms to the O2-service requirements specified in paragraphs (i)(1) and (i)(2) of § 1910.430.

7. Emergency Egress

(a) Regardless of the type of diving equipment used by a diver (i.e., open-circuit SCUBA or rebreathers), the employer must ensure that the equipment contains (or incorporates) an open-circuit emergency-egress system (a "bail-out" system) in which the second stage of the regulator connects to a separate supply of emergency breathing gas, and the emergency breathing gas consists of air or the same nitrox breathing-gas mixture used during the dive.

(b) As an alternative to the "bail-out" system specified in paragraph 7(a) of this appendix, the employer may use:

(i) For open-circuit SCUBA, an emergency-egress system as specified in § 1910.424(c)(4); or

(ii) For a semi-closed-circuit and closed-circuit rebreather, a system configured so that the second stage of the regulator connects to a reserve supply of emergency breathing gas.

(c) The employer must obtain from the rebreather manufacturer sufficient information to ensure that the bail-out system performs reliably and has sufficient capacity to enable the diver to terminate the dive and return safely to the surface.

8. Treating Diving-Related Medical Emergencies

(a) Before each day's diving operations, the employer must:

(i) Verify that a hospital, qualified health-care professionals, and the nearest Coast Guard Coordination Center (or an equivalent rescue service operated by a state, county, or municipal agency) are available to treat diving-related medical emergencies;

(ii) Ensure that each dive site has a means to alert these treatment resources in a timely manner when a diving-related medical emergency occurs; and

(iii) Ensure that transportation to a suitable decompression chamber is readily available when no decompression chamber is at the dive site, and that this transportation can deliver the injured diver to the decompression chamber within four (4) hours travel time from the dive site.

(b) The employer must ensure that portable O2 equipment is available at the dive site to treat injured divers. In doing so, the employer must ensure that:

(i) The equipment delivers medical-grade O2 that meets the requirements for medical USP oxygen (Type I, Quality Verification Level A) of CGA G-4.3-2000 ("Commodity Specification for Oxygen");

(ii) The equipment delivers this O2 to a transparent mask that covers the injured diver's nose and mouth; and

(iii) Sufficient O2 is available for administration to the injured diver from the time the employer recognizes the symptoms of a diving-related medical emergency until the injured diver reaches a decompression chamber for treatment.

(c) Before each day's diving operations, the employer must:

(i) Ensure that at least two attendants, either employees or non-employees, qualified in first-aid and administering O2 treatment, are available at the dive site to treat diving-related medical emergencies; and

(ii) Verify their qualifications for this task.

9. Diving Logs and No-Decompression Tables

(a) Before starting each day's diving operations, the employer must:

(i) Designate an employee or a non-employee to make entries in a diving log; and

(ii) Verify that this designee understands the diving and medical terminology, and proper procedures, for making correct entries in the diving log.

(b) The employer must:

(i) Ensure that the diving log conforms to the requirements specified by paragraph (d) ("Record of dive") of § 1910.423; and

(ii) Maintain a record of the dive according to § 1910.440 ("Recordkeeping requirements").

(c) The employer must ensure that a hard-copy of the no- decompression tables used for the dives (as specified in paragraph 6(a) of this appendix) is readily available at the dive site, whether or not the divers use dive-decompression computers.

10. Diver Training

The employer must ensure that each diver receives training that enables the diver to perform work safely and effectively while using open-circuit SCUBAs or rebreathers supplied with nitrox breathing- gas mixtures. Accordingly, each diver must be able to demonstrate the ability to perform critical tasks safely and effectively, including, but not limited to: recognizing the effects of breathing excessive CO_2 and O_2; taking appropriate action after detecting excessive levels of CO_2 and O_2; and properly evaluating, operating, and maintaining their diving equipment under the diving conditions they encounter.

11. Testing Protocol for Determining the CO_2 Limits of Rebreather Canisters

(a) The employer must ensure that the rebreather manufacturer has used the following procedures for determining that the CO_2-sorbent material meets the specifications of the sorbent material's manufacturer:

(i) The North Atlantic Treating Organization CO_2 absorbent-activity test;

(ii) The RoTap shaker and nested-sieves test;

(iii) The Navy Experimental Diving Unit ("NEDU")-derived Schlegel test; and

(iv) The NEDU MeshFit software.

(b) The employer must ensure that the rebreather manufacturer has applied the following canister-testing materials, methods, procedures, and statistical analyses:

(i) Use of a nitrox breathing-gas mixture that has an O_2 fraction maintained at 0.28 (equivalent to 1.4 ATA of O_2 at 130 fsw, the maximum O_2 concentration permitted at this depth);

(ii) While operating the rebreather at a maximum depth of 130 fsw, use of a breathing machine to continuously ventilate the rebreather with breathing gas that is at 100% humidity and warmed to a temperature of 98.6 degrees F (37 degrees C) in the heating- humidification chamber;

(iii) Measurement of the O_2 concentration of the inhalation breathing gas delivered to the mouthpiece;

(iv) Testing of the canisters using the three ventilation rates listed in Table I below (with the required breathing-machine tidal volumes and frequencies, and CO_2-injection rates, provided for each ventilation rate):

Table I. -- Canister Testing Parameters

Ventilation rates (Lpm, ATPS[1]) Breathing machine tidal volumes (L) Breathing machine frequencies (breaths per min.) CO_2 injection rates (Lpm, STPD[2])

22.5

40.0

62.5 1.5

2.0

2.5 15

20

25 0.90

1.35

2.25

1 ATPS means ambient temperature and pressure, saturated with water.

2 STPD means standard temperature and pressure, dry; the standard temperature is 32 degrees F (0 degrees C).

(v) When using a work rate (i.e., breathing-machine tidal volume and frequency) other than the work rates listed in the table above, addition of the appropriate combinations of ventilation rates and CO2-injection rates;

(vi) Performance of the CO2 injection at a constant (steady) and continuous rate during each testing trial;

(vii) Determination of canister duration using a minimum of four (4) water temperatures, including 40, 50, 70, and 90 degrees F (4.4, 10.0, 21.1, and 32.2 degrees C, respectively);

(viii) Monitoring of the breathing-gas temperature at the rebreather mouthpiece (at the "chrome T" connector), and ensuring that this temperature conforms to the temperature of a diver's exhaled breath at the water temperature and ventilation rate used during the testing trial; (1)

(ix) Implementation of at least eight (8) testing trials for each combination of temperature and ventilation-CO2- injection rates (for example, eight testing trials at 40 degrees F using a ventilation rate of 22.5 Lpm at a CO2-injection rate of 0.90 Lpm);(x) Allowing the water temperature to vary no more than 2.0 degrees F (1.0 degree C) between each of the eight testing trials, and no more than 1.0 degree F (0.5 degree C) within each testing trial;

(xi) Use of the average temperature for each set of eight testing trials in the statistical analysis of the testing-trial results, with the testing-trial results being the time taken for the inhaled breathing gas to reach 0.005 ATA of CO2 (i.e., the canister-duration results);

(xii) Analysis of the canister-duration results using the repeated-measures statistics described in NEDU Report 2-99;

(xiii) Specification of the replacement schedule for the CO2-sorbent materials in terms of the lower prediction line (or limit) of the 95% confidence interval; and

(xiv) Derivation of replacement schedules only by interpolating among, but not by extrapolating beyond, the depth, water temperatures, and exercise levels used during canister testing.

Footnote (1) NEDU can provide the manufacturer with information on the temperature of a diver's exhaled breath at various water temperatures and ventilation rates, as well as techniques and procedures used to maintain these temperatures during the testing trials. (Back to text)

[69 FR 7363, Feb. 17, 2004]

APPENDIX D

GE MASTER LOTO PROGRAM

GENERAL ELECTRIC COMPANY

LOCKOUT TAGOUT (LOTO) PROGRAM

Effective Date: January 1, 2009

TABLE OF CONTENTS

Description **Page**

LIST OF TABLES

LIST OF FIGURES

Number **Description** **Page**

INTRODUCTION

The purpose of this program is to establish comprehensive General Electric Lockout and Tagout (LOTO) expectations and requirements. It establishes General Electric's expectations regarding safe methods of controlling energy during servicing and/or maintenance of machines and equipment. This program was designed to prevent injuries caused by unexpected activation of hazardous energies. Unexpected release of hazardous energy can include any unintended motion, energization, start-up or release of stored energy, deliberate or otherwise, from the perspective of the person(s) at risk.

This program provides for decision-making flexibility regarding hazardous energy control methodology. Alternative methods, when used, are based upon risk assessment. However, LOTO continues to be emphasized as the primary hazardous energy control approach.

The General Electric LOTO program will help the facility or operation/organization comply with country-specific regulatory requirements and the company EHS policy.

This program constitutes the minimum global General Electric Company LOTO expectations. The most important element of the program is that General Electric personnel and contractors shall not perform activities, as defined in Paragraph 0, with equipment energized. In special situations, a risk assessment process may be used to document the necessity to work on energized equipment (e.g., it is not possible to perform the task while using LOTO). In these situations, alternative energy control procedures providing equivalent protection to employees are required. There are other requirements and country specific regulations that will also need to be reviewed and addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment. This program provides General Electric's expectations regarding:

- responsibilities of all personnel involved in hazardous energy control;
- design issues that influence the methods of controlling energy sources;
- hazardous energy control program elements necessary for employee protection;
- development of alternative methods of energy control for tasks that are routine, repetitive and integral to the process, or where traditional Lockout/Tagout prohibits the completion of those tasks;
- special applications where traditional methods of hazardous energy control are inappropriate or impractical;
- communication and training requirements for involved personnel; and
- management review of the total hazardous energy control process to ensure its functioning effectiveness.

TOP TEN SAFETY ACTIVITIES FOR LOTO

The top ten core requirements for using LOTO to prevent injuries are:

1. **One Lock, One Key, One Person:** The basis of LOTO is that any individual has "total control" of the lockout of the machine, equipment, process or circuit that is being serviced and/or maintained. This concept assures the individual sole lockout responsibilities.
2. **Effective Training:** Understanding lockout responsibilities, processes, methods and requirements result from effective LOTO training practices. The knowledge attained through training is reflected by practices of the site/operation. Effective training is proven by periodic inspection and includes provisions for demonstration and performance feedback.
3. **Alternative Methods:** Complete LOTO is always the first choice. Alternative methods are only permitted if 1) LOTO is not feasible or 2) the activity is considered to be routine, repetitive and integral to the production process. The alternative methods must be developed through Risk Assessment that includes identification, review and communication of additional regulatory requirements such that adequate protection is provided.
4. **Authorized/Affected Individuals:** Authorized individuals must be knowledgeable and able to perform all aspects of the LOTO process. Affected individuals must understand and respect the LOTO and not attempt to modify or remove LOTO done by others.
5. **The Proper Tools:** LOTO is conducted with a specific set of tools. These tools include keys, locks, multiple lockout devices, red tags and transition tags. Proper use and application of these tools is learned through this program and effective training.
6. **Equipment-specific LOTO Procedures:** Equipment-specific LOTO procedures provide detailed guidelines for safe lockout of each machine, equipment, process or circuit that is being serviced and/or maintained.
7. **LOTO Verification:** A "Zero Energy State" must exist in the machine, equipment, process or circuit before servicing and/or maintenance activities can begin. The best method possible must be used to verify that energy has stopped, released, dissipated or drained completely. Verification provides certainty that energization cannot occur while work is being performed. The verification (or "tryout") step must be included in each equipment or process-specific LOTO procedure.
8. **Shift or Personnel Changes:** The maximum permitted duration for a LOTO is one shift or the end of the task, whichever is shorter. Continuity of the LOTO process must occur as shifts or personnel change. This applies to both individual and group LOTO. It is important to assure that the LOTO process remains intact

during these transition times by using direct LOTO hand-off, Transition Locks or other approved methods.

9. **LOTO for Contract Activities:** Whether contractors are working at a site/operation or General Electric individuals are performing contract work, it is of the utmost importance that all aspects of the General Electric LOTO policy are adhered to. As a best practice, the General Electric authorized representative may perform the LOTO step-by-step process (refer to Paragraph 0). The outside service or contractor will then be required to attach and secure Individual LOTO Locks and red tags to the same energy-isolating devices that the General Electric representative has locked out. This is commonly called "GE first on / last off".
10. **Risk Assessment:** Risk assessment explores the safest conditions possible for individual work assignments. Risk assessment establishes safe practices and alternative methods to reduce the possibility of injury when normal LOTO procedures cannot be applied. The risk assessment must also include identification and implementation of control measures for other regulatory requirements.

SCOPE, PURPOSE AND APPLICATION

SCOPE

This program establishes requirements for the control of hazardous energy associated with machines, equipment, processes and circuits that could cause injury to personnel.

This standard covers maintenance and/or servicing of equipment when unexpected energization or start-up of the equipment, or release of stored energy, could cause injury to employees. In addition, this program establishes minimum performance requirements for the control of hazardous energy. A key element of this program is the development of equipment or process-specific LOTO procedures for specific equipment.

PURPOSE

The primary purpose of this program is to furnish LOTO procedures that will significantly reduce the risk of injury for all General Electric employees and contractors. This standard establishes requirements and performance objectives for procedures, techniques, designs and methods that protect personnel where injury can occur as a result of the unexpected release of hazardous energy.

Total energy isolation is the expected method of energy control. There are provisions for alternative actions that must be followed when energy isolation is not possible. (Paragraph 0 discusses this further.)

APPLICATION

LOTO Application

This standard applies to, but is not limited to, activities that are performed on a machine, a piece of equipment, a process or circuit. Primary, secondary, stored and single source energy sources require a lockout when performing servicing and/or maintenance activities. Primary energy sources are the main energy sources, such as electricity, gas, fluids, etc., provided to machines, equipment, processes and circuits.

Secondary energy sources are downstream from the primary (or main) energy source. Secondary energy lockout points are used to isolate a specific component of a system without the necessity of locking out the entire system.

Stored energy must also be taken into consideration. Stored energy, such as motion, pressure, gravity, capacitance or temperature, is a potential hazard that still exists after a primary energy source has been locked out. For example, a pump motor for a hydraulic system may be locked out, effectively stopping fluid flow, but energy in the form of pressure may still exist in an accumulator. This pressure in the accumulator should be bled off before work proceeds. All stored energy must be controlled to ensure complete machine safety.

Single source machines are machines, equipment, processes and circuits that can be completely deactivated through the isolation and locking out of a single energy source.

Below is a listing of typical activities in which energy control procedures apply:

- erecting
- installing
- constructing
- repairing
- adjusting
- inspecting
- unjamming
- setting up
- troubleshooting
- testing
- cleaning
- dismantling
- servicing
- maintaining
- lubricating

LOTO applies to all sources of energy, including, but not limited to, those energy sources listed below:

- Primary and Secondary Energy Sources
  - Electrical
  - Pneumatic
  - Hydraulic
  - Gases
  - Water
  - Steam
  - Chemical/Coolant
  - Radiation
  - Magnetic

- Stored Energy Sources
  - Rotation (mechanical motion that can cause machine or equipment movement): flywheels, circular blades, etc.
  - Gravity (suspended material or parts that will move when energy is disconnected): dies, heads, elevators, etc.
  - Mechanical Energy (stored mechanical energy that can cause machine or equipment movement): compressed or extended springs, etc.
  - Thermal Energy (extreme heat above 140 degrees Fahrenheit, or cold below 41 degrees Fahrenheit): ovens, boiling water, chillers, etc.
  - Electrical Energy (stored electricity): batteries, capacitors, etc.
  - Hydraulic Energy (residual pressure): accumulators, lines, cylinders, etc.
  - Pneumatic (residual pressure): storage or surge tanks, lines, etc.
  - Gas (residual pressure): pipes, tanks, etc.
  - Water (residual pressure or stored): pipes, tanks, etc.
  - Steam (residual pressure): pipes, boilers, etc.
  - Chemicals/Coolant (residual pressure or stored): pipes, tanks, containers, etc.

Alternative Methods

When LOTO is not used for tasks specified in Paragraph 0 that are routine, repetitive and integral to the process, alternative methods of energy control may be used. The alternative methods are based on risk assessment and shall provide effective personal protection. There are other requirements and country specific regulations that will also need to be reviewed and addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment. (Refer to Section 5.3 and APPENDIX A.)

The reason for operator intervention (i.e., perform the task) is to sustain the machine, equipment, process or circuit continuity within the nominal performance range and output quality. This usually occurs when the machine, equipment, process or circuit is operating normally and the need for periodic service is predictable based on operating experience and product demands. Also, the tasks do not require that the machine, equipment, process or circuit be taken out of the operational mode to accomplish them.

Each site/operation shall be required to inventory and examine all tasks deemed to be "routine", "repetitive" and "integral to the process" and develop alternative methods based on risk assessment. If the tasks being reviewed do not substantially conform to the criteria, then LOTO must be used. Examples of tasks that may fall onto the inventory could include daily lubrication routines and tool changes.

NOTE

Minor tool changes and/or adjustment, set-up, unjamming, part location and cleaning do not require LOTO unless these conditions exist:

- bypassing or removing of guards or safety devices.
- placement of any body part in the machine, equipment, process or circuit operating area.
- no alternative method has been assigned to the task.
- task-specific training has not been provided.

If the situation does not fall under the "routine and repetitive" exception, and LOTO is not feasible for the given situation, an alternative procedure based on Risk Assessment must also be developed. This alternative risk assessment and procedure must also include a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment.

The site or operation must only allow for the use of an alternative method if it is very clear that complete LOTO cannot be used in the situation. Alternative methods are not be allowed where LOTO is feasible and the alternative methods if they simply present an easier, faster, less complex, or less costly approach to energy control. Examples of tasks that may not be feasible with complete LOTO could include robot teaching and electrical troubleshooting

LOTO DEFINITIONS

Adjacent Equipment/ Process: Adjacent machine energy sources are the primary and stored energy sources of a machine, equipment, process and circuit that, while not related to the primary machine, their nearness may present a hazard to persons working on the primary machine. To ensure safety, hazardous energy from adjacent equipment/processes should be identified. The minimum depth of clear working space on energized equipment, and the determination of the safe working distance needs to be determined.

Affected Individual: An individual who operates equipment on which maintenance or servicing is being performed under LOTO, or an individual who works in the area where such maintenance or servicing is being performed. This individual is not authorized to perform LOTO.

Alarm: An audible or visual means to alert personnel to an impending hazard, e.g., motion, or that a failure or malfunction of a machine, equipment, process and circuit has occurred.

Alternative Methods:	Methods developed for energy control and protection of personnel for situations where complete LOTO cannot be used. Methods are developed based on risk assessment of the machine, equipment, process and circuit. This alternative risk assessment and procedure must also include a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment. (Refer to Paragraph 0 and APPENDIX A.)
Associated Equipment/Process:	Associated <u>energy sources</u> are those energy sources that interface with the primary piece of machine, equipment, process and circuit, but whose power is not dependent upon that machine, equipment, process and circuit. For example, a drill fixture may receive parts from a robot that takes parts off a conveyor, but removing power from the drill fixture does not remove power from the robot or the conveyor. The robot and conveyor may each be powered independently, but their physical association with the drill fixture is such that, for ultimate safety, these pieces must also be locked out. Therefore, both the robot and the conveyor have associated energy sources that must be identified.
Authorized Individual:	A person who is properly trained and authorized to perform <u>hazardous energy</u> control (LOTO).
Control Header or Circuit:	The means of initiating or interrupting energy to a machine, equipment, process and circuit; also the circuit of a control apparatus or system that directs the performance of a machine, equipment, process or circuit but does not directly interrupt the flow of energy. Control headers or circuits may be hydraulic, pneumatic, electric or electro-mechanical.

Control Reliability: A method to ensure that a device or system will stop or prevent initiation of hazardous motion in the event of a single component failure within the device or system.

Control System: Sensors, manual input and mode selection elements, interlocking and decision-making circuitry, and output elements provided to the operating devices or mechanisms of the machine, equipment, process and circuit.

De-energized: Physically isolated from all energy sources and not containing residual or stored energy. A zero energy state is verified as existing.

Dissipate: The process of removing stored energy from a machine, equipment, process or circuit. The energy source steadily declines to a zero value after the energy source has been shut off and locked.

Energized: Connected to an energy supply or containing residual or stored energy.

Energy-Isolating Device: A mechanical device that physically prevents the transmission or release of energy, including, but not limited to, the following: a manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently, a line valve, a block and any similar device used to block or isolate energy.

A device that utilizes a positive means, such as a lock, to hold an energy isolating system in a safe position and prevent the equipment from being energized.

Energy isolating devices also include blank flanges and bolted slip blinds. The authorized employee applying the device will have exclusive control of the device.

NOTE: Locks and multiple lock adapters are Lockout Devices, **not** Energy Isolating Devices

Energy Source:	A resource that produces power, or has the potential to produce power, in forms of electricity, flow, pressure or movement.
Extended LOTO	A process where GE LOTO Supervisor inserts his/her lock and tag at customer lockout device or group lockbox or other comparable mechanism and takes the key and places it in a group lockout box in GE work space (such as a trailer) and then ensures that all GE or affiliate employees place their personal lock and tag on the group lockout box in GE work space NOTE: Extended LOTO can only be performed at customer sites where customer prohibits all GE or affiliate employees to insert their personal lock & tag in their lockout device or group lock box or other comparable mechanism.
Exclusive Personal Control:	A means by which a single person controls equipment that may impact his/her safety.
Feasibility (Infeasibility)	A high standard of determining whether or not something can be done or is "feasible" to do. For GE purposes there are three potential elements in feasibility determination. (1) Cost. Costs associated with safety are generally considered reasonable or "feasible" unless they would have a significant adverse impact on the profitability of the business. (2) Technical. Something is NOT feasible when it can be shown through a documented analysis that the necessary equipment or engineering technology is unavailable. (3) Operational. Due to the nature of a specific business it may not be reasonable or "feasible" to use certain controls or methods. For example, in a distributed or services workforce, it may not be possible or "feasible" to bring all employees together frequently for training. **NOTE:** When an operation has determined through a feasibility study that certain company expectations are not feasible, the following steps are to be taken: (1) Use risk assessment to develop alternative control methods providing equivalent protection to employees. (2) Review with the business level EHS team.

General LOTO Lock: A key lock that is not assigned to an individual employee as an Individual LOTO Lock. This lock has only one key and master keys are not available. This lock may be used to lock out individual energy-isolating devices or energy sources when group or complex group LOTO is used. This lock may be left on for durations of greater than one shift. This lock is unique within the facility and is to be used only for LOTO.

Guard: A physical barrier or device that prevents access to areas of the machine, equipment, process and circuit where a hazard exists.

Hardwired: Operates independently of any programmable logic control devices.

Hazardous Energy: Any electrical, mechanical, hydraulic, pneumatic, chemical, nuclear, thermal, gravity or other energy (including potential and/or kinetic) that could cause injury to personnel.

Individual LOTO Lock: A type of key lock that is used for no other purpose in the facility/operation, having one key, and for which master keys are not available. Such locks are individually assigned (personal lock) to authorized individuals, or can be obtained from a central repository of LOTO devices, whereupon they become personal locks while in use by an individual. LOTO Locks are typically colored red.

Integrator: An entity that is responsible for assembling a group of interrelated or interacting machine, equipment, process and circuit components.

Interlock: A device or system whereby the status of one control or mechanism allows or prevents the operation of another.

Lockout Device: A positive means, such as a lock, that secures an energy isolating device in the safe position and prevents the energizing of a machine, equipment, process and circuit.

LOTO (lockout/tagout): The placement of a lock and red tag on the energy-isolating device in accordance with an established procedure, indicating that the energy isolating device shall not be operated until removal of the lock and red tag, in accordance with an established procedure.

Manufacturer: An entity that designs, fabricates, assembles or supplies machines, equipment, processes and circuits.

Modifier: An entity that changes or alters an existing machine, equipment, process or circuit so that its operation is affected in regard to the control of hazardous energy.

Red Tag "Danger Do Not Operate": Red tags (must be red in color) are used with every Personal LOTO Lock to indicate that the energy source is locked out and an authorized employee is actively working on the machine, equipment, process or circuit. Red tags may also be used with General Locks, but are not required to be used with General Locks. See Figure 2 for an example red tag design

Remanufacturer: Any entity whose business is the redesign or reconstruction of a machine or equipment.

Risk Assessment: A comprehensive evaluation of the probability and the degree of the possible injury or damage to health in a hazardous situation. The risk assessment is used to select appropriate safeguarding. This risk assessment must also include a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment. (Refer to Para 0 and APPENDIX A.)

Safe Working Distance When a risk assessment has determined that energy isolation is not feasible and work is going to be conducted on equipment that is unable to be de-energized, there are no other alternatives, and/or there are components on adjacent equipment that are energized and pose a hazard to the workers, a safe working distance must be determined and communicated to the workers in accordance to regulations within the country where work is being performed.

Safety Signs: A visual alerting device in the form of a sign, label, decal, placard or other marking that advises the observer of the nature and degree of the potential hazard(s) that can cause injury or death.

Servicing and/or Maintenance: Any activities to machine, equipment, process and circuit that represent repairs, preventive maintenance, modifications and installation (refer to Paragraph 0). These activities require that the machine, equipment, process or circuit, or their components, be at a "zero energy state". The personnel performing these activities must employ LOTO in accordance with established procedures. When LOTO of the machine, equipment, process and circuit cannot be performed, alternative methods shall be employed. This risk assessment to identify alternative methods must also include a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures, some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment.

(refer to Paragraph 0 and APPENDIX A).

Site/Operation: An entity that utilizes machines, equipment, processes and circuits covered by this procedure, and is responsible for personnel associated with hazardous energy control. This also includes customer locations where General Electric personnel may render services at the customer's request.

Tagout Device: A prominent warning, such as a tag and its method of attachment, that secures an energy-isolating device in a safe position and prevents the energizing of a machine, equipment, process or circuit.

Transition Lock: A key lock for which multiple keys may be available and is used on equipment or processes when they are not actively being serviced. Key control or access must be limited to a small, closely controlled group of authorized individuals. This lock must used in combination with a Transition tag "Caution do not Operate" to indicate an unsafe to operate condition. This lock must not be used as an Individual

LOTO Lock and may never be used on equipment that is being actively serviced. This lock is also used with a Transition tag for the transition of complex/group LOTO when there is a gap between active work shifts.

Transition tag "Caution Do Not Operate": Transition tags (must be yellow in color) are used to indicate that a machine, equipment, process or circuit is out of service or inoperable, but no one is actively working on the system. Transition tags are not to be used in place of red tags. No activity to the machine, equipment, process and circuit may occur when a transition tag is placed. Transition tags are to be used only when energy control is needed for servicing or maintenance. Transition tags are not to be used as general "out of service" tags and may only be applied by Authorized Employees. See Figure 2 for an example transition tag design.

RESPONSIBILITIES

SITE/OPERATION

The site/operation shall be responsible for complying with the applicable provisions of this program by establishing an effective program for the protection of individuals from hazardous energy during activities listed in Paragraph 0.

The site/operation shall fully implement the provisions of this program within six (6) months of the effective date. New site/operations or acquisitions shall fully implement this program within six (6) months of initial operations as GE.

When General Electric is retained as a service provider at a customer site, General Electric personnel will adhere to this program, although special circumstances may require utilization of alternative actions. Upon request of the customer and approval by a qualified General Electric authorized employee, General Electric personnel may follow the customer's LOTO program, provided the program ensures equal or greater protection to authorized individuals. For additional information, refer to APPENDIX E.1 - Field Services.

AUTHORIZED INDIVIDUALS

Authorized individuals shall be identified by site/operation and be responsible for performing hazardous energy control in compliance with the site-specific program, procedures and detailed training provided to them by the General Electric business and/or site/operation.

AFFECTED INDIVIDUALS

Affected individuals consist of all personnel who are not authorized individuals and who must receive LOTO awareness training, which will include the importance of not attempting to start up a locked out machine, equipment, process or circuit. Affected individuals need to recognize and understand LOTO procedures.

HAZARDOUS ENERGY CONTROL PROGRAM

LOTO PROGRAM

The site/operation/service organization shall establish a written program for hazardous energy control that details the requirements of the LOTO program and the development and approval of alternative methods where appropriate. The written program shall be based on this LOTO program and the General Electric Framework Workplan for Health and Safety Framework Element 21, Lockout-Tagout. The purpose of the program is to ensure that risk of exposure to hazards will be eliminated or minimized before any authorized individual performs any activity where the unexpected energizing, start-up or release of stored energy could occur and cause injury (see Figure 1).

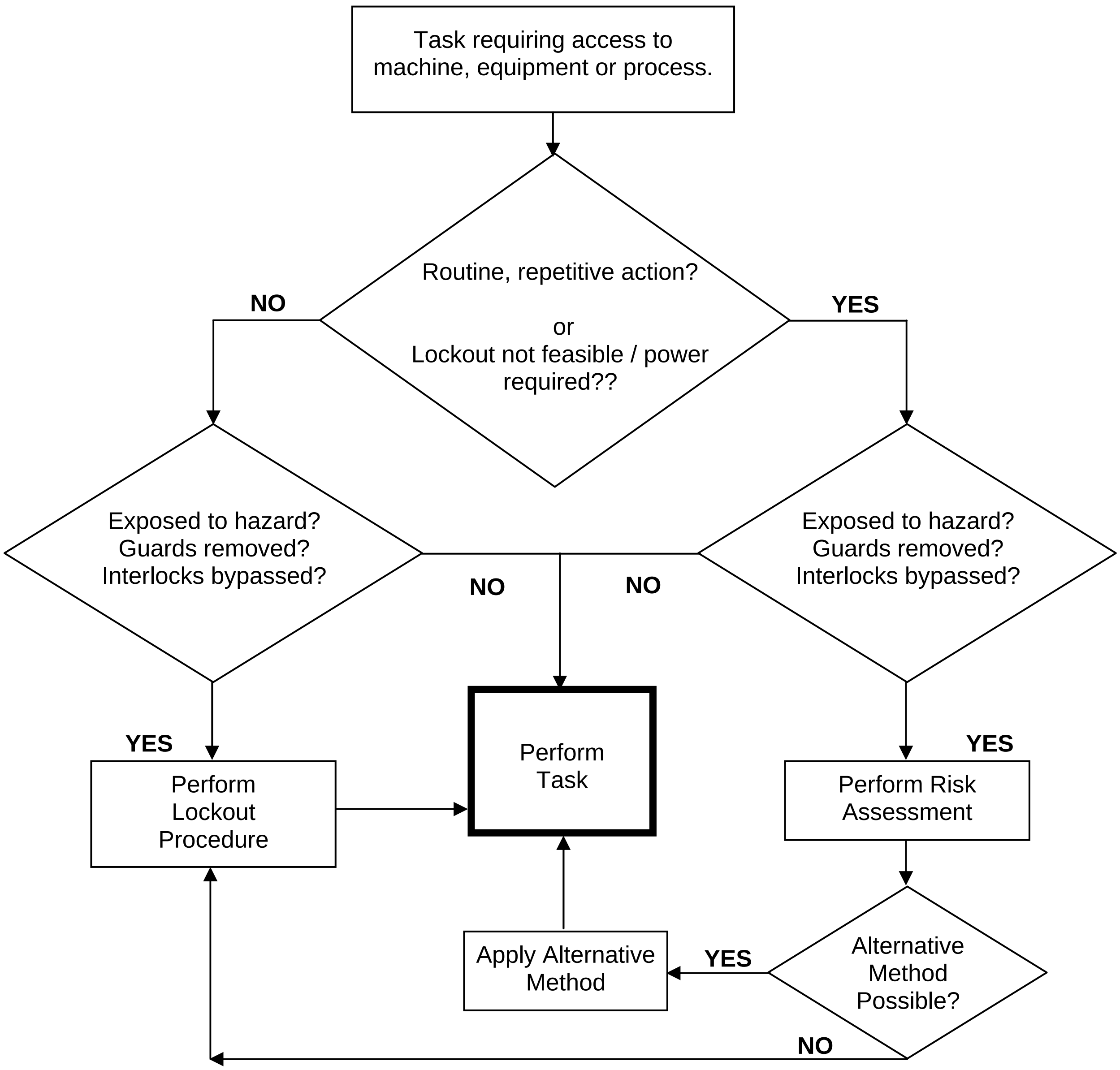


Figure 1. Decision Matrix for Safeguarding Hazardous Energy

Key Elements of the LOTO Program

The LOTO program shall consist of the following elements to provide effective protection of personnel:

- survey and inventory of all hazardous energy (electrical, pneumatic, hydraulic, etc.);
- identification of all isolation points (i.e., by labeling each point or specifically indicating the location of the isolation points in the written equipment specific LOTO procedures);
- identification of energy-isolating devices needed;
- selection and procurement of protective materials and hardware;
- assignment of duties and responsibilities;
- written procedures (site specific and equipment/process specific) documenting the shut-down, de-energization, verification, re-energization and start-up sequences; for machines, equipment and processes;
- training, re-training and evaluation of personnel;
- periodic inspections;
- auditing of program elements.

General Requirements for LOTO

LOTO shall be used on all energy-isolating devices capable of being locked out. An energy-isolating device is capable of being locked out if it has one of the following:

- a hasp or other means of attachment to which, or through which, a lock can be affixed;
- a locking mechanism built into it;
- a means to achieve lockout without the need to dismantle, rebuild or replace the energy-isolating device, or permanently alter its energy control capability.

Performing maintenance or servicing tasks covered by this program while the equipment or process is energized is prohibited, unless the following apply:

- the Risk Assessment (RA) documents the necessity of working energized;
- the RA is approved by both operations leadership and EHS;
- the RA establishes the alternative procedures to be used;
- This risk assessment must also include a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures, some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment.

- authorized employees who will perform the task have been trained on the alternative procedures; and
- other training required by regulation has been completed.

Tagout only is prohibited unless a risk assessment documents the inability to lockout and develops approved alternative methods. If an energy-isolating device is not capable of being locked out or modified to accept lockout, a tagout program shall be used as defined by the risk assessment for the equipment or process. When field service employees work in industries where lockout is not used (U.S. power generation and distribution industries are regulated under a special LOTO standard that does not require LOTO), the risk assessment process may be used to assess or develop alternative procedures. This risk assessment can be performed in advance, and can apply to all similar work situations for that business. (Refer to Paragraph 0 and APPENDIX A.)

When a tagout device is used on an energy-isolating device that is NOT capable of being locked out, the tagout device shall be attached at the same location where the lockout device would have been attached, and the site/operation (or Services Project Leader) shall demonstrate, through a risk assessment, that the tagout program adequately controls risk.

- In demonstrating that an effective level of safety is achieved in the tagout program, the site/operation shall demonstrate full compliance with all tagout-related provisions of this program, together with such elements as are necessary to provide equivalent safety available from the use of a lockout device. Additional protective means shall include, but are not limited to, the following: safe electrical work practices; safe working distance. (This should
    - be a hyperlink to the definitions section above.
    - the removal of an isolating circuit element by removal of fuses, blocking of a controlling switch, or opening an extra disconnecting device;
    - the removal of a valve handle to reduce the likelihood of inadvertent energization.

Equipment-specific LOTO Procedures

An important element of the overall hazardous energy control program is the development of equipment/process-specific procedures for all machines, equipment, processes and circuits. The procedures identify the machine, equipment, process and circuit and/or component name, energy type and magnitude, location and methods required to bring energy sources to a zero level. These procedures must be detailed and specific to the piece of equipment to be locked out, and if a specific order of lockout steps is necessary, that order must be clearly established.

Where an operation has more than one piece of similar equipment or more than one identical system or process line, the same procedure may apply to all, provided the actual energy isolation procedures and energy-isolating device locations are the same for all equipment. This practice is subject to verification that all such pieces of

equipment have been verified to operate in the same manner. These procedures shall be posted or otherwise readily available for authorized individuals to review and use. For example, a facility that has three identical mechanical power presses may have one procedure covering these three mechanical power presses. Similarly, another facility with six identical milling machines may have one procedure covering the six milling machines, provided that the locations of disconnects for each machine are clearly indicated in the procedure.

Plug-and-cord connected equipment: Where a machine, equipment, process or circuit has a single energy source that will accomplish complete deactivation, written procedures shall not be required as long as the disconnect for this energy source remains under the sole control of the authorized individual. This means within sight and arm's reach. This only applies to work on single energy source plug-and-cord connected electrical equipment for which exposure to the hazards of unexpected energization or start up of the equipment is controlled by unplugging the equipment from the energy source and by the plug being under the exclusive control of the individual performing the maintenance or servicing activity. If the plug cannot be maintained under the exclusive control of the individual, a lockout device must be used on the plug and an equipment specific procedure is required.

LOTO procedures for single energy source equipment that is not cord & plug connected may be handled as follows: Equipment for which the single energy disconnect is labeled, and the energy disconnect is immediately and obviously visible from the location of the equipment may be covered by a single equipment-specific LOTO procedure covering all equipment of this type at the site or operation. Individual equipment specific procedures are required for all other single source equipment that does not meet the conditions above.

Procedure Elements. The procedures shall clearly and specifically establish the requirements for effective isolation of the machine, equipment, process and circuit. Procedures shall include the following:

- identification of the machine, equipment, process and circuit;
- energy sources and magnitudes (i.e., 480V electrical, 90 psi air);
- listing of all required energy-isolating devices;
- specific procedural steps to obtain a zero energy state (shutting down, isolating, blocking and securing machine, equipment, process and circuit to control hazardous energy; dissipating stored electrical, kinetic, or potential energy);
- specific procedural steps for completing tryout, or verification that the machine, equipment, process and circuit has been fully de-energized;

- specific procedural steps for the placement, removal and transfer of lockout devices or tagout devices and the responsibility for them.

The site/operation shall prepare a written LOTO program detailing the development of LOTO procedures used at the facility. The procedures shall specify that prior to the performance of any servicing and/or maintenance activities, all potentially hazardous energy shall be identified, isolated, brought to a zero energy state, then locked out or tagged out.

The site/operation shall establish guidelines for consistent formatting of written procedures. For example:

- Validation: a knowledgeable person responsible for that procedure shall verify each procedure for its accuracy, completeness and energy control effectiveness. Validation must confirm that a zero energy state exists when procedures are performed.
- Approval: Each procedure shall be approved by the site/operation designee before implementation.
- Document Maintenance: The site/operation shall ensure that procedures are kept current and up to date by means of a change management system. Periodic reviews of procedures shall be conducted by the site/operation to ensure they are current. When a procedure has been revised, the current and previous revision of each procedure shall be retained. The date of creation, revision and update of each procedure shall be maintained.
- For customer locations where GE personnel may render services at the customer's request, refer to guidelines in APPENDIX E.1.1.

Protective Materials and Hardware. All applicable protective materials and hardware required to effect isolation of energy shall be provided by site/operation.

Each lockout device and tagout device shall be uniquely identified; shall be the only device(s) used for controlling hazardous energy; shall not be used for other purposes; and shall meet the following requirements:

- Lockout and tagout devices, including their means of attachment, shall be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.
- Lockout and tagout devices shall be standardized within the facility in at least one of the following criteria: color, shape, size, or specific markings; and additionally, in the case of tagout devices, print and format shall be standardized.
- Lockout and tagout devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal without the use of excessive force or destructive techniques.

- Locks shall have only a single key for which master keys are not available. NOTE: Transition Locks may have more than one key.
- Lockout and tagout devices shall indicate the identity of the authorized individual applying the devices.
- Red tags shall be affixed to every LOTO lock. Red tags will have the “Danger” header and a field for the date LOTO was applied. The red tag will indicate that the equipment is locked out and servicing and/or maintenance is actively being performed. Using a comment area on the tag can provide additional information about lockout, servicing and/or maintenance conditions. Red tags are not used as lockout devices alone. An example Red tag design is shown in Figure 2.
- Transition tags shall be affixed to a machine, equipment, process or circuit indicating an “out of service” or inoperable condition. A transition tag indicates that the machine, equipment, process or circuit is not operating and no service and/or maintenance activity is occurring. The header shall read “Caution” followed by “Do Not Operate”. Using a comment area on the tag can provide additional information about lockout, servicing and/or maintenance conditions. Transition tags are not used as lockout devices alone. An example design of a Transition tag is shown in Figure 2.
- Except where infeasible or prohibited by local regulation, Transition Locks shall be applied along with transition tags to prevent the inadvertent start-up of the equipment/process/circuit.
- "Out of service" tags may be used to indicate a long-term out-of-service condition and must be distinct in design (at least one of the following: color, pattern, warning text, etc.) from any tags used for LOTO or Transition purposes
- Tagout devices shall be constructed and printed so that exposure to weather conditions, wet and damp locations or corrosive environments will not cause the tag to deteriorate or the message on the tag to become illegible.
- Tagout devices shall warn against hazardous conditions if the machine or equipment is energized and shall include a legend such as one of the following: “Do Not Start,” or “Do Not Operate.”
- For customer site work, all applicable protective materials and hardware required to effect isolation of energy shall be provided by site/operation. Please refer to APPENDIX E.1.2.

Figure 2: Example designs of Red Tag and Transition Tag

All <u>energy-isolating devices</u> shall be identified by adequately labeling, marking or specifically identifying in the written <u>LOTO</u> equipment procedures to indicate their function, unless they are located and arranged so their purpose is evident. The identification shall include the equipment supplied, the energy type and magnitude. The marking shall be of sufficient durability to withstand the anticipated environment. LOTO procedures must clearly identify the exact locations of the energy-isolating devices by photographs, location maps or other means. The purpose of energy isolating device identification is to eliminate all possible sources of confusion for the authorized employee.

Marking of energy isolation devices shall be uniform within GE owned or controlled site/operations, and where allowed at customer locations.

Examples of marking and labeling include attached or embossed markings and signs such as: "Main Breaker (440 V) Press 3", "Natural Gas (50 psi) Shutoff Process Line 2", "Drive Power Isolation Axis X Only", "High Pressure (600 psi) Return Line Disconnect".

Electrical boxes can be labeled directly on the box. Valves can be labeled on the valve body or with a suspended sign or tag.

<u>LOTO</u> shall be performed only by <u>authorized individuals</u>. Authorized individuals may include, but are not limited to, maintenance, engineers, production managers and technicians. Authorized individuals isolate <u>energy sources</u> using <u>Individual LOTO Locks</u> and red tags provided by the <u>site/operation</u>.

<u>LOTO</u> METHODS

The selected method of <u>hazardous energy</u> control depends on whether the task can be performed with or without <u>energized</u> conditions. In all cases, the primary method of control shall be LOTO as specified in Paragraph 0. Develop and insert flow chart that includes LOTO to NFPA 70E to safe working distance to LOTO, etc).

When LOTO is not used for tasks that are routine, repetitive and integral to the process (refer to Paragraph 0), or performing LOTO would prohibit the completion of a task, alternative methods shall be used. However, before adopting alternative methods of control, the site/operation shall conduct a risk assessment that demonstrates the adequacy of the evaluation and the effectiveness of the protective measures (see Paragraph 0). LOTO Step-By-Step Process

Authorized individuals who are trained in the LOTO program are ready to perform the LOTO process. The step-by-step process defines the actions required in the LOTO process. The following actions should be done in the following sequence:

1. Preparation for shutdown: Authorized individuals shall understand the applicable procedures, acquire the necessary protective materials and hardware, identify the notification requirements, determine associated or adjacent machine, equipment, process and circuit and assess the consequences of the shutdown.
2. Notification of personnel: Personnel who may be affected shall be notified prior to the application and after the removal of lockout devices or tagout devices. (Personnel may include operators, technicians, engineers or area managers.)
3. Machine, equipment, process and circuit shutdown: Authorized individuals shall follow procedures established by site/operation including alternative methods and adherence to newly developed risk assessment to de-energize or shutdown machines, equipment, processes and/or circuits. The operator or technician may be required to ensure sequential shutdown. (Sequential shutdown decreases potential hazards and reduces possibilities of machine damage.)
4. Machine, equipment, process and circuit isolation: Authorized individuals physically locate all energy-isolating devices (disconnects, valves, etc.) required by the equipment-specific LOTO procedure. The energy-isolating devices are then positioned (closed, blocked, etc.) to stop energy flow to the machine, equipment, process and circuit. The authorized individuals shall verify the condition of the energy-isolating devices and their capability to stop energy flow.

NOTE

Partial or localized LOTO may be used on complex machinery, equipment, processes and circuits where it is necessary to:

- isolate power or motion for a specific component while maintaining power to other systems,
- support utilities and other devices and components.

Such procedures shall be documented in the equipment-specific LOTO procedure, or may be established through the risk assessment procedures. If the scope of work or job tasks change or take place during the work being performed, a new risk assessment must be developed and adhered to prior to continuation of the task. Lockout or tagout device application: The authorized individuals shall attach and secure lockout or tagout devices. Use the following guidelines:

- Individual LOTO Lock and red tag shall be attached and secured to the machine, equipment, process or circuit energy-isolating device (disconnect, valves, etc.). When an energy isolating location is not designed to accept a lock, use of a lockout device such as a clamshell, ball valve, circuit breaker, wall switch or gate valve is required. Note that “1 lock, 1 key, 1 person” is the rule that must be followed.

NOTE

Group lockout with lock box may also be used in complex, multi-person applications. See Paragraph 0 for an explanation of complex/group lockout.

- Verify that the energy-isolating devices remain “locked out” and in a “safe” or “off ” position.

- Where a red tag cannot be attached and secured directly to the energy isolating device, the red tag shall be located as close as safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the machine, equipment, process or circuit. In addition, a tag shall be placed at the operator’s control position to alert personnel that the machine, equipment, process and circuit are de-energized. For example, where an electrical bus with integral isolating switches is located overhead, the tag would be placed conspicuously on the operator panel warning not to use the equipment.

5. Controlling stored energy: The authorized individual shall ensure that all potentially hazardous energy (stored, residual, chemical or potential) is relieved, dissipated, restrained, drained or otherwise controlled. Additional measures may be necessary to prevent re-accumulation of energy to protect individuals. Examples of stored energy systems include accumulators, capacitors, gravity, surge tanks, chemical lines and springs.

Verification of isolation: The authorized individual shall verify that isolation and de-energization have been accomplished using the procedures in the equipment-specific LOTO procedure prior to starting servicing and/or maintenance on machines, equipment, processes and circuits that have been locked out or tagged out. Verification must confirm that the machine, equipment, process or circuit has achieved a “zero” energy state such as 0 electricity, 0 pneumatic, 0 fluid or gas pressures, etc. (Verification of a zero energy state can be accomplished by test equipment, circuit activation attempts, gages, visual inspection, etc.) Return to service: The authorized individual shall perform the following before returning the equipment to service:

- Inspect the work area to ensure that non-essential items have been removed, guards are in place, the machine, equipment, process or circuit is operationally intact, and all personnel are in a safe location.
- Remove locks, tags and lockout devices from each energy-isolating device by the authorized individual who applied the device or by compliance with Paragraph 0.
- Notify affected personnel that energy is about to be restored to the machine, equipment, process and circuit.
- Visually inspect and/or cycle test the equipment for servicing and/or maintenance task completion. If the task is completed the machine, equipment, process and circuit may be returned to service. If the task is not completed, repeat the necessary LOTO steps.
- Follow the proper sequential startup steps for the equipment, process or circuit.

Lock Application and Usage

Table 1 below summarizes the application and use of the three different types of locks covered in this program.

Table 1. Lock Usage

Lock Type	Purpose	Duration of Use	Lock Color	Key	Tags
General	Not assigned to an individual employee and used to lock out individual energy-isolating devices or energy sources when group or complex group LOTO is used.	Multiple shift use is permissible.	Specific lock color is not required but lock must be unique and used for LOTO only.	Only one key; master keys are not available.	Not required, but may be used.
Individual	Assigned to and used by authorized individuals only.	Single shift use only.	Specific lock color is not required but red is typically used.	Only one key; master keys are not available.	Red tags required.
Transition	Used on equipment or processes when they are not actively being serviced.	Multiple shift use is permissible.	Specific lock color is not required but lock must be unique and used for LOTO only.	Multiple keys are permissible and made available but key control or access is limited to a small, controlled group.	Transition tags required.

Provisions for Energy Control Interruption

In situations in which LOTO must be temporarily removed from the energy-isolating device(s) and the machine, equipment, process and circuit must be either fully or partially energized to test, troubleshoot or position the machine, equipment, process or circuit or a component thereof, the sequence of actions detailed in Paragraph 0, Step 0 shall be followed.

When the energy is no longer needed, re-apply LOTO according to the appropriate instruction found in Paragraph 0.

Procedures for LOTO Device Removal Without Authorized Employee

When the authorized individual who applied the LOTO device is not available to remove it, that device may be removed under the direction of the site/operation leadership, provided that specific procedures and training for such removal have been developed, documented and incorporated into the energy control program. This system should be comprised of at least three individuals knowledgeable of the work being performed in addition to the following elements:

- verification by the appropriate supervisory personnel that the authorized individual who applied the device is not reasonably available or not at the facility;
- ensuring that the authorized individual has been informed before he/she resumes work at that facility that his/her lockout or tagout device has been removed.

Group and Complex Group LOTO

Machine, equipment, process and circuit may require servicing and/or maintenance by more than one authorized individual. Each authorized individual performing service and/or maintenance must apply his/her Individual LOTO Lock. Every authorized individual who applies an Individual LOTO Lock shall verify that the machine, equipment, process or circuit has attained a zero energy state or observe the verification process. Multiple lock application can be accomplished with the following:

- multiple lock devices (hasps) that accommodate several Individual LOTO Locks;
- The use of General LOTO Locks and a lock box. For example, if a machine with multiple energy sources is going to be serviced by multiple personnel, it may be useful to use General LOTO Locks at the energy sources. Keys for the General LOTO Locks are held in lock boxes to which employees attach their Individual LOTO Locks.
- Lock boxes when an energy-isolating device can accommodate only one key. This key is placed inside the lock box and all authorized individuals servicing and/or maintaining the machine, equipment, process and circuit secure and attach their Individual LOTO Locks.

Complex group LOTO conditions arise when all energy-isolating devices protecting the affected work activity are secured by LOTO but are not controlled directly or via lock box by each authorized individual, and more than one of the following conditions applies;

- a significant number of energy-isolating devices or authorized individuals are involved;
- the energy isolating device(s) is relatively inaccessible; and
- there is interdependence and interrelationship of the system components.

For cases similar to that mentioned above, the site/operation shall designate authorized individuals who shall be responsible for ensuring an equivalent level of personal protection for each member of the group. Methods of achieving this protection may include utilizing individual continuous accountability methods such as work permits, control boards, etc. Verification shall take place to determine the effectiveness of the energy isolation. For customer site guidelines, refer to APPENDIX E.1.3.

NOTE

In the servicing and/or maintenance of sophisticated and complex process equipment utilized in the petroleum, utility, metal and chemical industries, adaptation and modification of normal group LOTO procedures may be necessary to ensure the safety of the employees performing the servicing and/or maintenance.

Refer to the Group/Complex LOTO decision tree in APPENDIX C.

LOTO Supervisor

Rare circumstances may exist in which it is safer to rely on a single authorized individual to oversee LOTO for other employees, rather than train all individual employees in proper LOTO procedures. These circumstances may occur when, due to individual employee skill level and system complexity, a greater hazard may occur when normal LOTO is practiced. This section creates a limited authorization to allow a qualified authorized individual to oversee LOTO protection for one or more non-authorized employees. These employees will be given locks by the LOTO Supervisor and shown where to place them to assure their individual control of the energy source(s) while working. Any authorized individual who is asked to serve in a LOTO Supervisor role must acknowledge that they are accepting responsibility for the safety of all personnel to be protected by the LOTO. Per the requirements listed below, a site/operation may implement a LOTO Supervisor system when:

- A risk assessment has been completed that documents the greater hazard that would be controlled by using the LOTO Supervisor method, and the specific alternative procedures to be implemented.
- The global Business Level Health & Safety Leader (not a sub-business within one of the major GE businesses) has reviewed the risk assessment and provided documented approval of the need for the use of the LOTO Supervisor approach and the specific alternative procedures to be used. Such approvals may be in the form of a blanket approval or procedure for LOTO Supervisor applications that are expected to be repeated periodically.
- All employees to be protected by LOTO receive training on the procedures the LOTO Supervisor follows. The employees have the right to either perform LOTO verification or observe the LOTO Supervisor perform verification.
- The LOTO Supervisor must be present on the facility at all times that the LOTO is in place, and must be in possession of a list of all employees protected by the LOTO.

- Lockouts under the LOTO Supervisor method are limited to the length of the task or the end of the shift, whichever is shorter.

For group verification guidelines, refer to APPENDIX E.2.

Placement of a LOTO under the LOTO Supervisor method involves the following steps:

- Place the LOTO following the procedures in Section 5.2.1 LOTO Step-by-Step Process, and the equipment-specific LOTO procedure for the equipment or process being locked out.
- Inform the employees to be protected by the LOTO of their right to perform the verification step, or observe the LOTO Supervisor perform verification, and provide the employees with the opportunity to exercise this right.

Shift or Personnel Changes

The maximum permitted duration for a LOTO is one shift or the end of the task, whichever is shorter. Specific procedures shall be utilized during shift or personnel changes to ensure the continuity of LOTO protection. This includes provisions for the orderly transfer of LOTO devices between off-going and on-coming authorized individuals. There are two distinct methods of shift or personnel change LOTO transition. These methods should never be mixed or combined. (See Figure 3)

Option 1: The immediate hand-off of LOTO in progress. Authorized individuals of the outgoing shift remove their Individual LOTO Locks and red tags. Authorized individuals of the next shift simultaneously apply and secure their Individual LOTO Locks and red tags at the same energy-isolating device and verify that a zero energy state exists in the system via the "tryout" process.

Option 2: Application of Transition Locks. Authorized individuals use this method when servicing and/or maintenance continues over multiple shifts, but there is no immediate hand-off of LOTO in progress. The steps of the method are listed below:

- The authorized individual that was performing servicing and/or maintenance removes his/her Individual LOTO Lock and red tag.
- A Transition Lock and transition tag are then attached and secured to the same energy-isolating device.
- The Transition Lock and transition tag remain in place until the next worker arrives to continue the work.
- The transfer key will be controlled by the next shift maintenance supervisor or similar authorized person.
- The next worker to work on this machine (second authorized individual) removes the Transition Lock(s) and transition tag(s) and applies his/her Individual LOTO Lock(s) and red tag(s).

- Second authorized individual verifies “zero” energy with the “tryout” process. Note that if the original worker will be the one to continue the work on the next day, this person will keep control of the key(s) belonging to the Transition Lock(s). Alternatively, all authorized employees in a department (for example, Maintenance) may hold a key for the department Transition Locks.

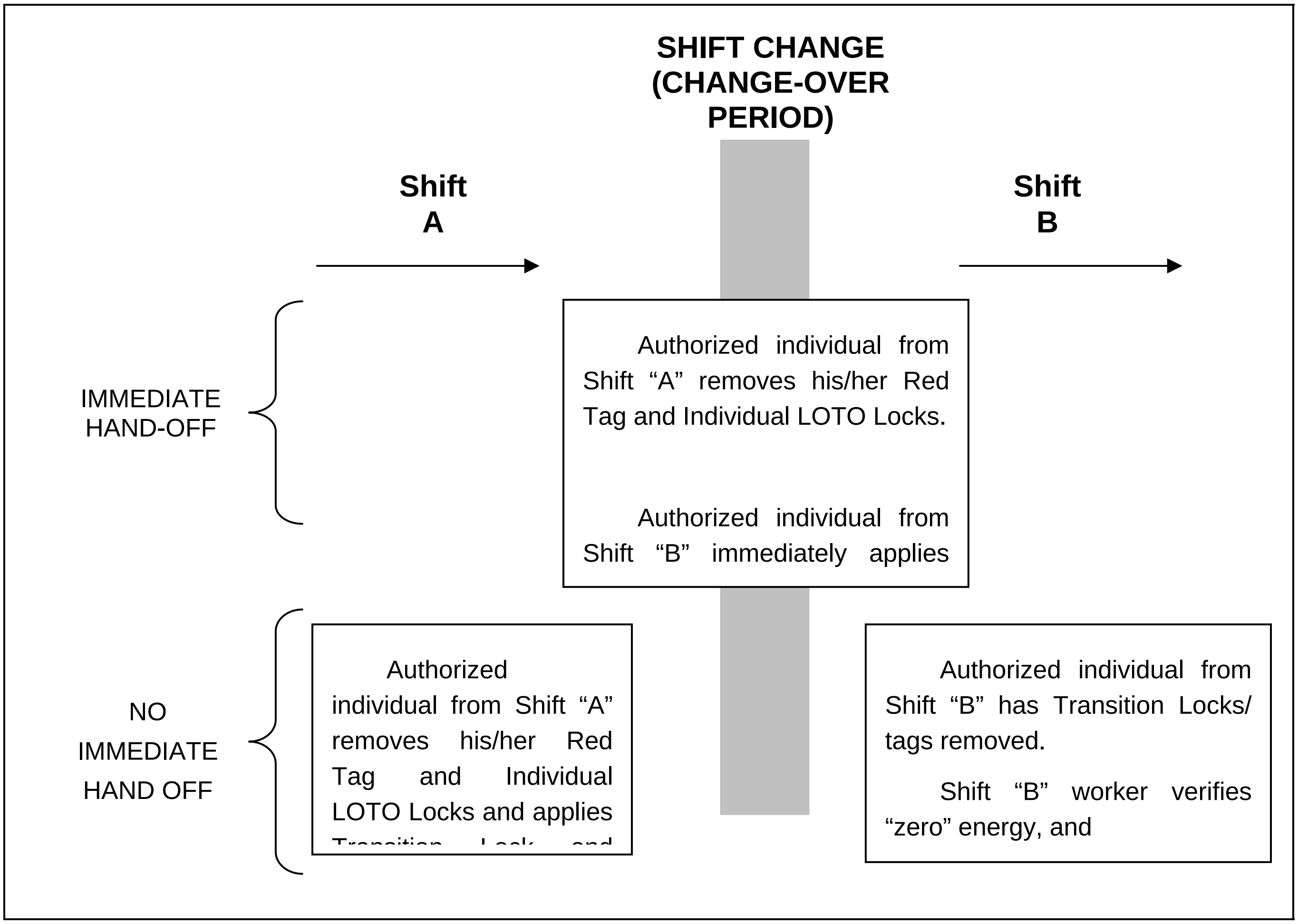


Figure 3. Sample of LOTO Shift or Personnel Changes

NOTE

Original LOTO (red tag and <u>Individual LOTO Lock</u>) may remain in place if the worker who originally applied them has not physically left the site, and the servicing and/or maintenance will be completed within the same shift. For example, if servicing and/or maintenance is temporarily interrupted while waiting for a part, the original LOTO can remain in place. If the servicing and/or maintenance is not completed within that original shift, the procedures using <u>Transition Locks</u> will need to be followed.

If the equipment or process is in an "out of service" condition, then the transition locks and tags may not be used. "Out of service" tags or another tagging methods shall be used in these situations.

Communication is an important part of the shift or personnel change process. LOTO and servicing and/or maintenance information must be exchanged between authorized “red” and “transition” tags, both of which have remark areas to provide additional information.

During the shift or personnel change process, every authorized individual who applies a Individual LOTO Lock shall verify (or observe verification) that the machine, equipment, process or circuit has attained a “zero” energy state.

NOTEs

Field Service personnel must coordinate LOTO procedures at the customers’ sites with their customer representative. Generally, energy isolation devices cannot be secured without permission from the customer, and in concert with the site personnel. Further, isolation devices are removed only after communication with the customer representative.

Customer sites with GE controlled work environment and where the **customer prohibits** the use of transition lock & tag, an authorized employee may leave his/her LOTO locks & tags on the lockout device, lockbox or other comparable mechanism for the duration greater than one (1) shift, provided the following controls are in place: (1) The LOTO Supervisor must perform prior to each shift a re-verification of critical energy isolation source(s) for the LOTOed system before giving authorization to his/her employee to resume work, (2) Affected GE businesses must include the above provision in their business level LOTO Procedure. Sites where customer controls the work environment, GE LOTO Supervisor, at the beginning of each work shift must review customer energy isolation source(s), re-verify critical isolation source (s) and make necessary changes to the onsite GE LOTO process, if required before authorizing his/her employees to resume work on customer LOTOed equipment/systems

Remote or Noncontiguous Locations

DELETED

Outside Service or Contractor Personnel

The LOTO program and procedures of outside services or contractors must provide protection equal to or better than the General Electric LOTO program. General Electric requires that LOTO programs for outside services or contractors are reviewed by authorized General Electric personnel. General Electric and outside service or contractor personnel shall each designate a representative responsible for determining their relationship, responsibilities and obligations regarding hazardous energy control prior to the outside service or contractor starting work or providing services.

As a best practice, the General Electric authorized representative may perform the LOTO step-by-step process (refer to Paragraph 0). The outside service or contractor will then be required to attach and secure Individual LOTO Locks and red tags to the same energy-isolating devices that the General Electric representative has locked out.

Hazard Notification. General Electric personnel shall inform the outside service or contractor-designated representative of any special or unique hazards that are related to the machinery, equipment, process or circuit and that may endanger the outside service or contractor employees.

Program Coordination. All outside service organization or contractor programs shall be coordinated with General Electric's hazardous energy control program when there is integration of job tasks. Protection for all individuals within the facility who may be affected shall be mutually understood, communicated and agreed upon between the parties.

Communications. General Electric personnel and outside services or contractors shall keep each other informed of any activities or conditions that may adversely affect the application of hazardous energy control or impact the normal operation of machines, equipment, or processes and circuits. The General Electric representative should supply the service or contractor with a copy of the operation/site-specific LOTO program. The General Electric representative should review with outside services and contractors all expectations, rules and hardware involved in the LOTO process. All written copies of the contractors' LOTO program and all project safety information shall be kept on file with the General Electric representative for the life of the project.

NOTE

Examples of activities or conditions that warrant communication between the parties include interruption of energy supply, disabling a fire protection/security system, emergency alarm systems, hazardous area ventilation and special equipment that is needed for energy isolation.

General Electric as the Outside Service. The responsibility of General Electric personnel when involved in providing services includes:

- complying with the General Electric LOTO program;
- assessing and making determination (by a qualified General Electric Authorized Employee) that customer LOTO programs provide equivalent protection as General Electric programs where the customer wants/requires adherence to their procedures;
- communicating with the customer regarding LOTO requirements and conditions;

- reporting deviations and/or discrepancies to your Business Level Health and Safety or EHS Leader;
- discontinuing work when presented with an unsafe condition.
- Conducting this risk assessment that includes a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment.

FIELD SERVICE PERSONNEL SHOULD REQUEST CUSTOMER EQUIPMENT-SPECIFIC LOTO PROCEDURES WHEN PERFORMING SERVICING AND/OR MAINTENANCE ACTIVITIES. RISK ASSESSMENT MUST BE PERFORMED TO ESTABLISH ENERGY CONTROL PROCEDURES WHEN CUSTOMER LOTO DOCUMENTATION DOES NOT EXIST. RISK ASSESSMENT ON CUSTOMER EQUIPMENT SHOULD INVOLVE A CUSTOMER REPRESENTATIVE KNOWLEDGEABLE ON THE EQUIPMENT WHENEVER POSSIBLE. ALTERNATIVE METHODS

When LOTO is not used for tasks that are routine, repetitive and integral to the production process (refer to Paragraph 0), or traditional LOTO prohibits the completion of those tasks, then an alternative method of control shall be used.

Selection of an alternative control method by the site/operation or the field service personnel shall be based on a risk assessment of the machine, equipment, process and circuit as specified in Paragraph 0. The risk assessment shall take into consideration that existing safeguards provided with the machine, equipment, process and circuit may need to be removed or modified to perform a given task.

The alternative method selected shall have detailed procedures developed and documented for the control of hazardous energy and authorized employees shall be trained in these procedures prior to implementation.

The process for developing alternative procedures can also be applied to situations where a customer requests that General Electric employees use customer LOTO procedures. A knowledgeable authorized employee can review the customer procedures to determine whether they are at least as protective as General Electric procedures. If so, then General Electric employees may be trained on and utilize the customer procedures.

NOTE

- Activities that might be performed using alternative methods include die changing, production part jam clearing, make-ready, lubrication, tool changes and set-up.
- It is important that the correct devices are selected for the application. An engineering review will ensure that proper safety

devices are utilized. If the engineering review identifies an application where special engineered devices such as blocks, racks, supports, pins, etc. are required, these devices shall be designed and built using adequate safety factors.

Risk Assessment

Risk assessment shall be performed to determine alternative methods for tasks that either a) cannot be performed under LOTO or b) are routine repetitive and integral to the production process. Risk assessment determines an overall safety strategy for a machine, equipment, process or circuit that does not require LOTO. The results of risk assessment include:

- awareness of hazards related to the task to be performed;
- familiarity with the task process;
- availability of reference documents (risk assessment forms (see APPENDIX A));
- identification of personal protective equipment for use during task performance.
- Includes a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment.

Please refer to Alternative Methods in Paragraph 2.3.2.

General Electric risk assessment procedures are detailed in APPENDIX A.

Hierarchy of Alternative Control Implementation

A hierarchical process shall be employed in the selection of alternative control methodologies in the following order of preference:

- eliminate the hazard through design;
- use administrative controls (such as safe work procedures, practices and training) as specified in Paragraph 0;
- use personal protective equipment as specified in Paragraph 0.

When the alternative methodology has been determined, appropriate communication and training of individuals shall be developed and provided.

NOTE

The objective of this process is to select the highest level of feasible control(s). In many cases, application of any single control methodology is not adequate to provide an effective level of protection for personnel.

It may be necessary to use a combination of the methodologies to provide individuals with equivalent protection to LOTO.

Exclusive Personal Control

The site/operation or field service personnel shall provide a means of exclusive personal control to prevent exposure to the hazardous energy. Equipment, procedures and methods are designed so that authorized personnel performing alternative methods have absolute control. Some exclusive personal control examples include the following:

- a robot teach pendant may be considered an exclusive control device if the operator is holding the pendant at all times, the robot is in slow speed (teach mode) and the pendant has an automatic off switch if it is not held;
- manually-actuated controls within sight and arm's reach may be considered an exclusive control device.

For extended LOTO system guidelines, refer to APPENDIX E.1.3.

Personal Protective Equipment

When engineered safeguards, warning/alerting techniques, safe work procedures or any combination of these factors do not provide an acceptable level of protection for the authorized individual performing the work, then the use of personal protective equipment identified from the risk assessment will be required.

COMMUNICATION AND TRAINING

Communication

The operations leader for the site operation shall be responsible for ensuring that all affected and authorized individuals are informed regarding the provisions of the hazardous energy control program. The operations leader for the operation shall also be responsible for ensuring that appropriate authorized individuals are apprised of aspects of the hazardous energy control program such as changes in the program, incident experience, progress against the plan, performance data, auditing results and other pertinent details.

Training Overview

Authorized individuals shall be trained prior to performing any type of LOTO activity. Affected individuals shall also be trained per this program. Table 2 is a summary of the training requirements. Table 3 summarizes the training frequency requirements. (Paragraphs 0 and 0 provide additional training details for these individuals.)

Table 2. Training Requirements

	Affected Individuals	Authorized Individuals
Applications	Yes	Yes
Definitions	Yes	Yes

Table 2. Training Requirements (continued)

	Affected Individuals	Authorized Individuals
Elements	Yes	Yes
Requirements	Yes	Yes
Machine Specific Procedures	No	Yes
Step-by-Step Methods	No	Yes
Shift Personnel Change	*	Yes
Alternate Methods	**	Yes

* Must understand the continuity of LOTO when shifts change.

** May be involved in the use of some alternate methods that do not require LOTO (e.g., dressing weld tips, nozzle changes, etc.).

Table 3. Training Frequency Summary

	Affected Individuals	Authorized Individuals
Initial training	**Required** (on topics outlined in Table 2)	**Required** (on topics outlined in Table 2)
Initial demonstration	Not applicable	**Required** (must be observed and verified by another authorized employee, i.e. "hands on")
Annual refresher training	Recommended	Recommended
Annual demonstration	Not applicable	**Required** (must be observed and verified by another authorized employee) Note: for distributed or field workforces, live "hands on" observation is required every third year and in the other years may be accomplished by use of computer simulated demonstrations

Affected Individual Training

The site/operation shall provide all affected individuals with LOTO awareness training. This training allows affected individuals to identify LOTO situations, understand their responsibilities and to take no action that might defeat the LOTO. Training requirements and objectives are listed below:

- Training shall be specific to the site/operation written program.
- Affected individuals shall recognize that authorized employees are performing service and/or maintenance to the machine, equipment, process and circuit that require LOTO.

- Affected individuals shall be able to identify locked out equipment.
- Affected individuals shall have a general understanding of shift or personnel LOTO changes.
- Affected individuals shall recognize that a transition tag indicates a "Do Not Operate" situation.

Every effort should be made to structure training to make it understandable to all affected individuals regardless of their level of education, primary language or disabilities. Annual refresher training should be conducted to maintain an appropriate level of awareness.

Authorized Individual Training

The site/operation shall provide initial training, prior to performing a LOTO that will demonstrate that all authorized individuals understand the purpose and function of the energy control program. Training shall be such that all authorized individuals have an understanding that is appropriate for the level of hazard exposure they may encounter. Training requirements and objectives are listed below:

- Individual training shall be carried out prior to authorized individuals performing service and/or maintenance tasks or being potentially exposed to hazardous energy.
- Training shall be specific to the site/operation written program.
- Field Service personnel shall receive training on electrical safety and the General Electric LOTO programs. Specific information regarding hazardous energy in the field locations shall be discussed during pre-job safety meetings with customer representatives.
- Field Service Personnel: If the scope of work or job tasks change or take place during the work being performed, a new risk assessment must be developed and adhered to prior to continuation of the task.
- Each authorized individual shall receive training in the type of energy that might be encountered during servicing and/or maintenance and methods or means to control and isolate that energy.
- The site/operation shall document that all initial and additional training has been conducted. The documentation shall contain each individual's name, dates of training and the training topic.

Each person completing the training MUST be required to successfully demonstrate LOTO to an authorized employee prior to being authorized to perform LOTO without direct supervision. Hands-on demonstration is required during initial training, and must be repeated annually under the observation of an authorized individual. The only exception to the annual hands-on requirement is discussed in Paragraph 5.4.6. The site/operation should avoid exclusive use of generic training programs to ensure that authorized individuals adequately understand the site/operation-specific program. Documentation of the information covered during training shall be maintained.

Training methods may include, but are not limited to, formal instruction (direct instructor contact), computer-based or interactive training.

Annual refresher training should be conducted to maintain an appropriate level of awareness.

Additional Training

Retraining shall be provided for all authorized individuals whenever there is a change in their job assignments, a change in machine, equipment, process or circuit that presents a new hazard, or when there is a change in the energy control procedures.

Additional retraining shall also be conducted immediately whenever an audit reveals, or whenever the site/operation has other reason to believe, that the authorized individual's knowledge or use of the energy control procedures is inadequate or inconsistent with the requirements.

Demonstration of Training

The site/operation shall conduct an annual demonstration of the effectiveness of the training that is conducted for each authorized individual. This "hands on" demonstration is observed and verified by another authorized employee. The demonstration shall be done in such a way as to ensure that authorized individuals demonstrate the following:

- knowledge of the program;
- recognition and understanding of hazardous energy types;
- use of appropriate hazardous energy control procedures.

Authorized individuals who do not demonstrate an adequate level of knowledge or use of appropriate hazardous energy control procedures shall be retrained.

For remote or distributed field service work forces, demonstration that is observed and verified by another authorized employee may not be feasible each year. In these situations, simulation demonstrations may be acceptable. At a minimum, there must be a live person-to-person demonstration following the authorized employees initial training session. In these situations, the site/operation must also have a random auditing process in place. This process should ensure that a reasonable number of authorized employees are checked for demonstration each year. At a minimum, live person-to-person demonstrations must occur every three years and a computer simulation can be used for the other two years in the three year cycle.

PROGRAM REVIEW

The site/operation shall annually assess the condition and effectiveness of each of the elements of the hazardous energy control program as described in General Electric Health and Safety Framework Scorecard Element 21. At a minimum, the assessment shall include:

- the written program;
- specific machine, equipment, process and circuit procedures;

- LOTO hardware;
- energy-isolating devices;
- alternative methods;
- communication and training.

Auditing and Inspections

The site/operation should determine the frequency of auditing (e.g., monthly) and an appropriate sample size. The audits should be random and address all shifts, days of operation, groups, non-standard work situations and individual personnel. Knowledgeable personnel should conduct visual observations of authorized individuals performing specific procedures. Feedback and documentation shall follow the observations. See APPENDIX D for a sample application inspection form.

Performance Feedback

The site/operation shall establish a documented system that inspects performance by authorized individuals and also provides both positive and negative feedback to appropriate individuals and supervisors regarding the hazardous energy control program. Where deficiencies are found, corrective action shall be taken and appropriate individuals informed of the required improvements. Appropriate disciplinary actions shall be implemented when defects are identified during the audit or when this General Electric program is not being followed by affected or authorized employees. When necessary, employee violations of this program shall be documented and appropriate disciplinary action taken. The enforcement of this program, and all safety regulations, can result in disciplinary procedures up to and including termination.

DESIGN

GENERAL ELECTRIC EQUIPMENT

All machines, equipment, processes and circuits that are to be delivered to General Electric shall be designed, manufactured, supplied and installed so that the site/operation can comply with the energy control guidelines explained in this program. It is General Electric's responsibility to review the suppliers' product to ensure that safety issues are addressed. The paragraphs in this section define what is expected of suppliers.

Modifications affecting energy isolation shall comply with or exceed these standard requirements. Machine, equipment, process and circuit design should incorporate employee safety as a priority. A risk assessment shall be performed during the engineering design stage of development. The risk assessment performs two functions; first, it determines the need for energy control devices and systems; second, it determines the appropriate type of energy control that is required.

Exposure Minimization

Verify that General Electric machines, equipment, processes and circuits employ available safeguards that are reliable, work to minimize hazard exposure and minimize any adverse effect on the process. The machines, equipment, processes and circuits should be designed or modified so that personnel are not exposed to hazardous energy during routine and repetitive servicing and maintenance activities.

NOTE

> This can be accomplished by positioning controls outside hazardous areas, adding controls at appropriate locations, providing external lubrication points or providing guarding.

Partial Energization

For those functions when partial energization is necessary, General Electric authorized individuals shall perform a risk assessment similar to that outlined in APPENDIX A to determine the safest method of machine, equipment, process and circuit access. When it is necessary for machines, equipment, processes and circuits to remain partially energized (e.g., in order to hold parts, save information, retain heat or provide local lighting), alternative control methodologies shall be provided for personnel safety and includes a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment energy isolating devices.

Verify that machines, equipment, processes and circuits are designed, manufactured, supplied and installed with energy-isolating devices to enable compliance with the requirements in Paragraph 0. Consideration shall be given to the intended use of the machine, equipment, process and circuit. Devices shall be capable of controlling or dissipating hazardous energy, or both. The devices should be an integral part of the machine, equipment, process and circuit.

ENERGY ISOLATING DEVICES

Verify that machines, equipment, processes and circuits are designed, manufactured, supplied and installed with energy-isolating devices to enable compliance with the requirements in Paragraph 0. Consideration shall be given to the intended use of the machine, equipment, process and circuit. Devices shall be capable of controlling or dissipating hazardous energy, or both. The devices should be an integral part of the machine, equipment, process and circuit.

Location

Verify that energy-isolating devices shall be accessible and, when feasible, be conveniently located to facilitate the application of lockout devices during service and maintenance.

NOTE

Energy-isolating devices are best located outside any hazardous areas, and at a convenient height away from any adjacent walking areas (i.e., not overhead, on ladders or under machinery).

Identification

Verify that all energy-isolating devices shall be adequately labeled or marked unless they are located and arranged so their purpose is clearly evident. The identification should be of consistent format within each facility or operation and shall include the following:

- machine, equipment, process and circuit supplied;
- energy type and magnitude. Examples of appropriate labeling or marking (tags, embossing, engraving, stenciling, etc.) language is as follows:
  - Main Power Press 3 (480V);
  - Natural Gas-Process Line 2;
  - Hydraulic Pump Discharge (800 psi);
  - Bay A Compressed Air (100 psi).

NOTE

The potential for error will be reduced if personnel are not expected to rely on memory or experience when determining which isolating devices apply to which machine, equipment, process and circuit. When placarding or posting contains the required energy isolating device identification, individual devices may be marked or coded and their identity referenced on the placard or posting information. Where conditions such as security are warranted, coded identification is acceptable.

Capability

Verify that energy-isolating devices shall be capable of either being locked or otherwise secured in an effective isolating position. Examples of effective isolating devices may include, but are not limited to the following:

- levers with aligning lock tabs (holes);
- ball cocks with aligning lock tags;
- locking covers that only work when the switch is in the safe position;
- wheels with locking tabs (and position indicators);
- physical blocks with locking, aligning tabs.

SPECIAL TOOLS OR DEVICES

If special tools or devices are necessary for servicing and/or maintaining the machine, equipment, process or circuit or their component parts, the tools or devices shall be provided with the machine, equipment, process or circuit.

WARNINGS AND SPECIAL INSTRUCTIONS

It is the responsibility of the manufacturer to determine if warnings and special instructions are necessary for servicing and/or maintaining the machine, equipment, process or circuit. General Electric shall require appropriate information from the manufacturer, integrator, modifier or remanufacturer in a written manual. In addition, where the manufacturer determines that warnings or special instructions should be located in the area of the hazard on a label, placard or sign, the manufacturer shall so affix or provide appropriate placard material to the site/operation for later installation.

COMPONENT ISOLATION

Verify that the machine, equipment, process or circuit installation shall provide for the local isolation of component parts or component systems if they are to be serviced or maintained separately. The number and location of energy-isolating devices shall be determined by the configuration of the machine, equipment, process or circuit and the intended application. Warning labels should be affixed to the machine, equipment, process and circuit when remote or separate sources of hazardous energy must be controlled.

DOCUMENTATION REQUIREMENTS

Each site shall require that written manual(s) (documentation) be provided by the manufacturers, systems integrators, modifiers and remanufacturers. The written manual (documentation) must detail:

- the specific location and procedures for use of the provided energy-isolating devices;
- step-by-step procedures for servicing and/or maintenance on any machine, equipment, process and circuit that must be performed under partial energization based on the results of a risk assessment;
- specific instructions for safely addressing such conditions as malfunctioning, jamming, misfeeding or other interruptions of the operation;
- installation instructions intended for the installer of the machine, equipment, process or circuit that identify the location of necessary energy-isolating devices.

STORED AND RESIDUAL ENERGY

When stored or residual energy has been determined to be a hazard, a means for non-hazardous dissipation or safe restraint of the stored or residual energy shall be incorporated into the machine, equipment, process and circuit. Devices and methods used for the dissipation of stored energy shall be designed with a means or method of verifying their position and state.

When machinery run-down or coasting is determined to be a hazard, guarding shall be installed that protects against the hazard or prevents access until the motion has ceased.

TOOL CHANGE, SET-UP

Some activities, such as set-up or troubleshooting, may require full or partial energization. For activities such as this, alternate protection systems are required. Alternate protection systems shall be used to ensure that a device or system will stop or prevent initiation of hazardous motion or release of hazardous energy in the event of a single component failure within the device or system. Typical methods of accomplishing this task are:

- a hardwired, control-reliable (redundant and safety relay monitored) safety interlock system;
- safety-rated, multiple-channel, Programmable Logic Controllers (PLC), when manufactured specifically for safety applications, applied per manufacturer's instructions, and a risk assessment is performed (see sample in APPENDIX A).

If control systems such as those listed above are not available, then LOTO procedures must be applied.

PHYSICAL SAFEGUARDS

Verify that physical safeguards (e.g., pins, blanks, blocks, restraints, chains or blinds) shall be designed, with the appropriate safety factor, to withstand all forces to which they will be subjected. Physical safeguards vary for different stored energy sources. Fabrication of special safeguard devices may be required when risk assessment of machines, equipment, processes and circuits is completed. Physical safeguards must be designed to minimize hazardous exposure.

APPENDIX A
RISK ASSESSMENT AND RISK REDUCTION

A.1 RISK ASSESSMENT

Risk assessment is an analytical tool consisting of a number of discrete steps intended to ensure that hazards are properly identified, that associated risks are evaluated and that appropriate measures are taken to reduce those risks to an acceptable level. Elements of a risk assessment process include the following steps:

1. Identify all tasks: All tasks and activities should be considered. Examples of activities for which tasks should be identified include set up, installation, removal, maintenance, operating, adjusting, cleaning, troubleshooting and programming.
2. Identify hazards: Hazards associated with each task, such as mechanical, electrical, thermal, pneumatic, hydraulic, radiation, residual or stored energy, motion, fuels and human factors should be considered. Associated hazards for a particular task not related to hazardous energy release may also need to be reviewed. Consideration should include human error, management system deficiencies and foreseeable improper use of equipment.
3. Identification of other applicable regulatory requirements: includes a review to determine if there are other requirements and country specific regulations that will also need to be addressed prior to the start of work to limit and/or eliminate employee exposures. Some examples may be, but are not limited to: NFPA 70E (Arc flash boundaries, flame resistant clothing, PPE, approach boundaries, etc); safe working distances from live parts; minimum depth of clear working space on energized equipment.
4. Assess the severity of harm: Severity of harm addresses the degree of injury or illness that could occur. The degrees are based on extent of injury or illness (from death to no injury), and extent of treatment involved. The following is an example of severity levels:
   - Catastrophic - death or permanently disabling injury or illness (unable to return to work)
   - Serious - severe debilitating injury or illness (able to return to work at some point)
   - Moderate - significant injury or illness requiring more than first aid (able to return to same job)
   - Minor - no injury or slight injury requiring no more than first aid (little or no lost work time)

(Note: When determining risk, the worst credible severity of harm is to be selected.)

5. Assess the probability of occurrence of harm:

   - Probability of occurrence of harm is estimated by taking into account the frequency, duration and extent of exposure, training and awareness, and the presentation of the hazard. The following is an example of probability levels:
     - Very likely - near certain to occur
     - Likely - may occur
     - Unlikely - not likely to occur
     - Remote - so unlikely as to be near zero
   - When estimating probability, the highest credible level of probability is to be selected. The following factors are considered important in estimating the probability of occurrence of harm:
     - exposure to a hazard;
     - personnel who perform tasks;
     - machine/task history;
     - workplace environment;
     - human factors;
     - reliability of safety functions;
     - possibility to defeat or circumvent protective measures;
     - ability to maintain protective measures.

6. Evaluate the risk: Based on the results of Steps 4 and 5 above, the level of risk is estimated by applying the level of severity of harm and the probability of occurrence of that harm to Table A-1.

Table A-1. Risk Estimation Matrix

Probability of Occurrence of Harm	**Severity of Harm**			
	Catastrophic	**Serious**	**Moderate**	**Minor**
Very Likely	High	High	High	Medium
Likely	High	High	Medium	Low
Unlikely	Medium	Medium	Low	Negligible
Remote	Low	Low	Negligible	Negligible
An example: a ‘serious’ severity of harm and a ‘likely’ probability of occurrence of that harm yield a ‘high’ level of risk.				

A.2 RISK REDUCTION (IMPLEMENTATION)

Risk reduction is a hierarchical process employed to reduce or control risk by the following:

- elimination through design;
- use of engineered safeguards;
- awareness means including warning and alerting techniques;
- administrative controls including safe work procedures and training;
- use of personal protective equipment;
- training.

Often, for any particular machine, equipment, process and circuit, the solution may include aspects of each of these elements. The risk reduction process should involve the affected personnel, should be documented and should adhere to the process outlined below and illustrated in .

The following questions should be asked to determine the adequacy of the risk reduction process:

- Is the safety level adequate? Can the task be performed without causing injury or damage to health?
- Have appropriate safety measures been taken for all tasks or activities? Are the measures taken compatible with each other?
- Do the safety measures generate any new, unexpected hazards or problems?

A.2.1 Risk Reduction by Design

Risk reduction should first attempt to eliminate the hazard through design. The primary objective in implementing design features is to eliminate hazards or reduce their risk by substitution.

A.2.2 Risk Reduction by Use of Engineered Safeguards

Safeguards or safety devices should be used to protect personnel from hazards that cannot be reasonably eliminated or sufficiently reduced by design.

Safeguards or safety devices and the safety control system (electrical, pneumatic, hydraulic, etc.) should be of a suitable reliability for the risk reduction that is required.

NOTE

Examples of engineered safeguards include guards (both fixed and interlocked), trapped key devices, and trip devices (light curtains, laser scanners, pressure mats, safety rated switches, etc.). Safety devices include, emergency stop buttons, enabling or hold-to-run devices, etc.

A.2.3 Risk Reduction by Use of Warning and Alerting Techniques

Warning and alerting techniques should be used to protect personnel from hazards that cannot be reasonably eliminated or sufficiently reduced by design, engineered safeguards, or a combination of these elements.

NOTE

Examples of warning and alerting techniques include attendants, audible and visual signals, barricades, signs and tags.

A.2.4 Risk Reduction by Use of Administrative Controls

Additional risk reduction is achieved by the use of administrative controls including safe work procedures, standard practices and checklists and training. These should be used to control risk that cannot be reasonably eliminated or sufficiently reduced by the use of design, engineered safeguards, warning and alerting techniques or a combination of these elements. Training should be used as a complement to all the risk reduction methods described here.

NOTE

Examples of safe work procedures, practices and training include standard operating instructions, illumination, pre-job review and establishing safe distances from a hazard. Examples of types of training that can be used to develop proficiency of authorized individuals may include computer-based simulation, drills, classroom programs or exercises.

A.2.5 Risk Reduction by Use of Personal Protective Equipment

Additional risk reduction is achieved by effective use of prescribed personal protective equipment (PPE). Strong administrative procedures must be in place for the PPE to be an effective safeguard.

NOTE

Personal protective equipment can include safety eyewear or shields, footwear, protective gloves (insulating or cut resistant) and protective headgear.

A.3 REVIEW THE RISK ASSESSMENT AND RISK REDUCTION

The risk assessment and risk reduction should be reviewed at the following times:

- following its implementation to ensure solutions are effective and in place;
- following an incident or near miss;
- whenever new tasks or activities are required;
- whenever there are modifications to the machine, equipment, process or circuit;
- on a periodic basis.

Figure A.1
(Informative)

Sample Risk Assessment for Alternative Methods

(Severity and probability estimation based on machine with no safeguards in place.)
(All risks initially determined to be intolerable without additional safeguarding.)

Department: 26 **Operation:** Block Machining

Task: Tool change-mill cutter at station 12 left.

Date: ___________________

			Before Risk Reduction			After Risk Reduction	
Task	**Hazards**	**Number of People Exposed to Risk**	**Severity/Probability** **Severity:** Catastrophic, Serious, Moderate, Minor **Probability:** Very Likely, Likely, Unlikely, Remote	**Risk Level** **High** **Medium** **Low** **Negligible**	**Protective Measures (Alternative Methods)**	**Severity/Probability** **Severity:** Catastrophic, Serious, Moderate, Minor **Probability:** Very Likely, Likely, Unlikely, Remote	**Risk Level** **High** **Medium** **Low** **Negligible**
Identify replacement tool	Cuts from sharp tooling		Moderate/Likely	Medium	Gloves and procedures	Moderate/Remote	Negligible
Inspect tool	Cuts from sharp tooling		Moderate/Likely	Medium	Gloves and procedures	Moderate/Remote	Negligible
Remove old cutter	- Crushing from transfer bar movement		Catastrophic/Likely	High	Interlocked guard with trapped key	Catastrophic/Remote	Low
	- Crushing, entanglement, cuts from mill cutter movement if energized		Serious/Likely	High	Interlocked guard with trapped key	Serious/Remote	Low
	- Cuts from sharp tooling		Moderate/Likely	Medium	Gloves and tool assist	Moderate/Remote	Negligible
	- Coolant in eyes		Moderate/Likely	Medium	Safety glasses	Moderate/Remote	Negligible
	- Burn from hot cutter		Moderate/Likely	Medium	Procedures and gloves	Moderate/Remote	Negligible
Install new cutter	- Crushing from transfer bar movement		Catastrophic/Likely	High	Interlocked guard with trapped key	Catastrophic/Remote	Low
	- Crushing, entanglement, cuts from mill cutter movement if energized		Serious/Likely	High	Interlocked guard with trapped key	Serious/Remote	Low
	- Cuts from sharp tooling		Moderate/Very Likely	Medium	Gloves and tool assist	Moderate/Remote	Negligible

Figure A-1. Sample Risk Assessment for Alternative Methods

Risk Assessment for Alternative Methods

Department: **Operation:**

Task:

Remarks and/or special conditions

Date: ____________________

			Before Risk Reduction			After Risk Reduction	
Task	**Hazards**	**Number of People Exposed to Risk**	**Severity/Probability** **Severity:** Catastrophic, Serious, Moderate, Minor **Probability:** Very Likely, Likely, Unlikely, Remote	**Risk Level** **High** **Medium** **Low** **Negligible**	**Protective Measures (Alternative Methods)**	**Severity/Probability** **Severity:** Catastrophic, Serious, Moderate, Minor **Probability:** Very Likely, Likely, Unlikely, Remote	**Risk Level** **High** **Medium** **Low** **Negligible**

Figure A- 2. Blank Risk Assessment Form

APPENDIX B
SAMPLE OF AN ENERGY CONTROL PROCEDURE

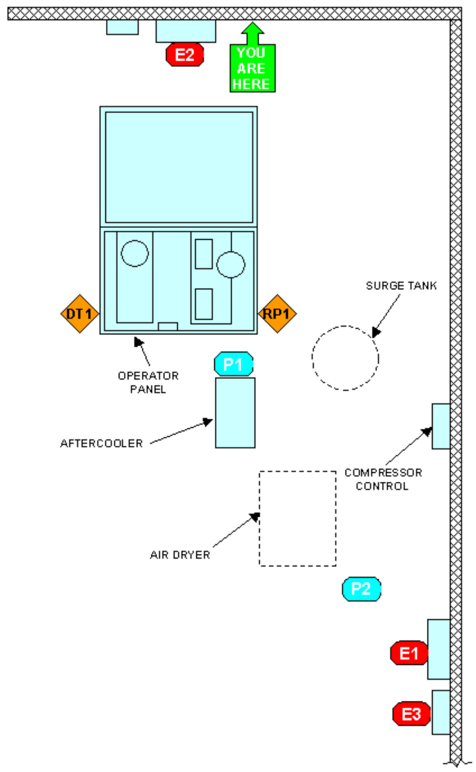
REMEMBER LOCKOUT

Safety Lockout / Tagout

STANDBY AIR COMPRESSOR

TORONTO, ONTARIO

Sheet 1 of 1



REMEMBER LOCKOUT

- Notify All Affected Personnel Before Servicing Equipment And Before Returning Equipment To Service
- Refer To Company Lockout Procedure For Lockout Requirements And Safe Practices
- Always Perform Check To Verify Energy Is Controlled
- Assure Release Of All Stored Energy
- Only Work Under Your APPROVED Lock

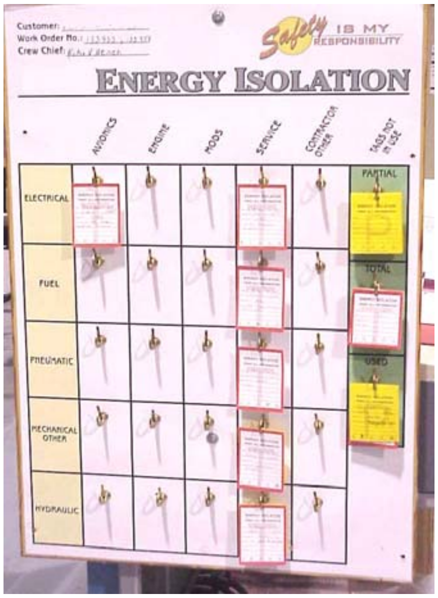
Always Perform Controlled Shutdown Before Locking Out Disconnects

Energy Type and Source	Lockout Location		Procedure for Locking Out and/or Releasing Energies	Verify Procedure
Electrical 600 Volts	E1	Main Standby Air Compressor Electrical Disconnect	Place disconnect switch in the off position and apply safety lock. Shuts off electrical power to the Standby Air Compressor circuits.	The Standby Air Compressor electrical circuits and indicators powered by this disconnect switch should not turn on and no action should occur.
Electrical 600 Volts	E2	Standby Air Compressor Electrical Disconnect	Place disconnect switch in the off position and apply safety lock. Shuts off electrical power to the Standby Air Compressor circuits.	The Standby Air Compressor electrical circuits and indicators powered by this disconnect switch should not turn on and no action should occur.
Electrical 600 Volts	E3	Standby and Main Air Compressor Controls Electrical Disconnect	Place disconnect switch in the off position and apply safety lock. Shuts off electrical power to the Standby and Main Air Compressor Controls circuits.	The Standby and Main Air Compressor Controls electrical circuits and indicators powered by this disconnect switch should not turn on and no action should occur.
Pneumatic 120 PSI	P1	Main Air Dryer Air Supply Shutoff Valve	Close shutoff valve and apply safety lock. Isolates air pressure from the Air Dryer circuits.	Attempt to manually operate Air Dryer pneumatic circuits. No action should occur.
Pneumatic 120 PSI	P2	Main Air Dryer Air Return Shutoff Valve	Close shutoff valve and apply safety lock. Isolates air pressure from the Air Dryer circuits.	Attempt to manually operate Air Dryer pneumatic circuits. No action should occur.
Pneumatic Pressure 120 PSI	RP1	Air Compressor Pressure Relief Valve	Lock out pneumatic supply. Open relief valve to release pressure from Air Compressor.	Visually confirm that pneumatic relief valve is in the open position.
Dissipate Thermal 180 °F	DT1	Hot Equipment Air Compressor	Isolate and lock out equipment heat source. Allow enough time for the equipment to cool down before proceeding.	Visually confirm that the appropriate heat source is locked out and the allotted time has passed for the equipment to cool.

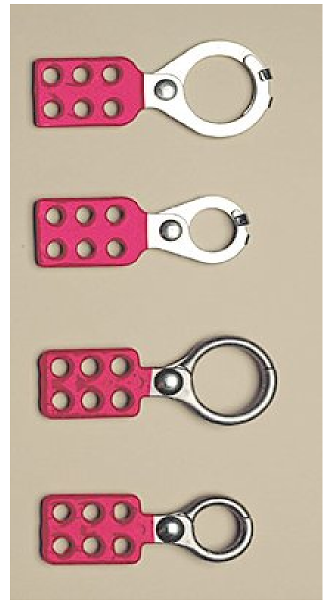
IF SYSTEM CANNOT BE LOCKED OUT OR IF SYSTEM FAILS VERIFICATION CONTACT YOUR SUPERVISOR. STOP

EHS REVIEW		MANUFACTURING REVIEW	
APPROVAL NAME	______	APPROVAL NAME	______
DATE	______	DATE	______

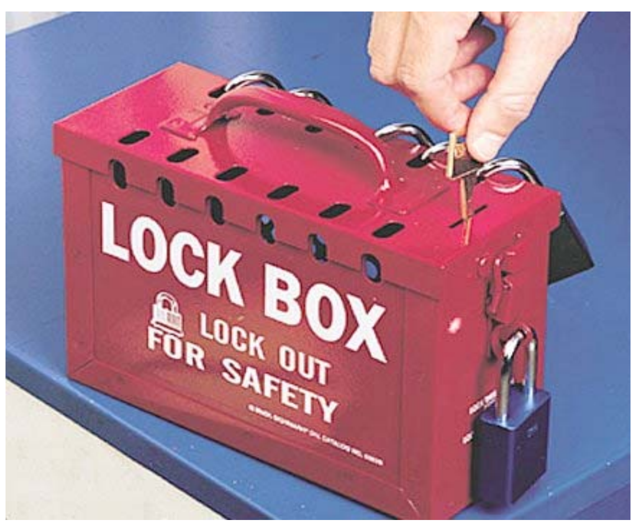
APPENDIX C
GROUP LOTO



Lockout Board



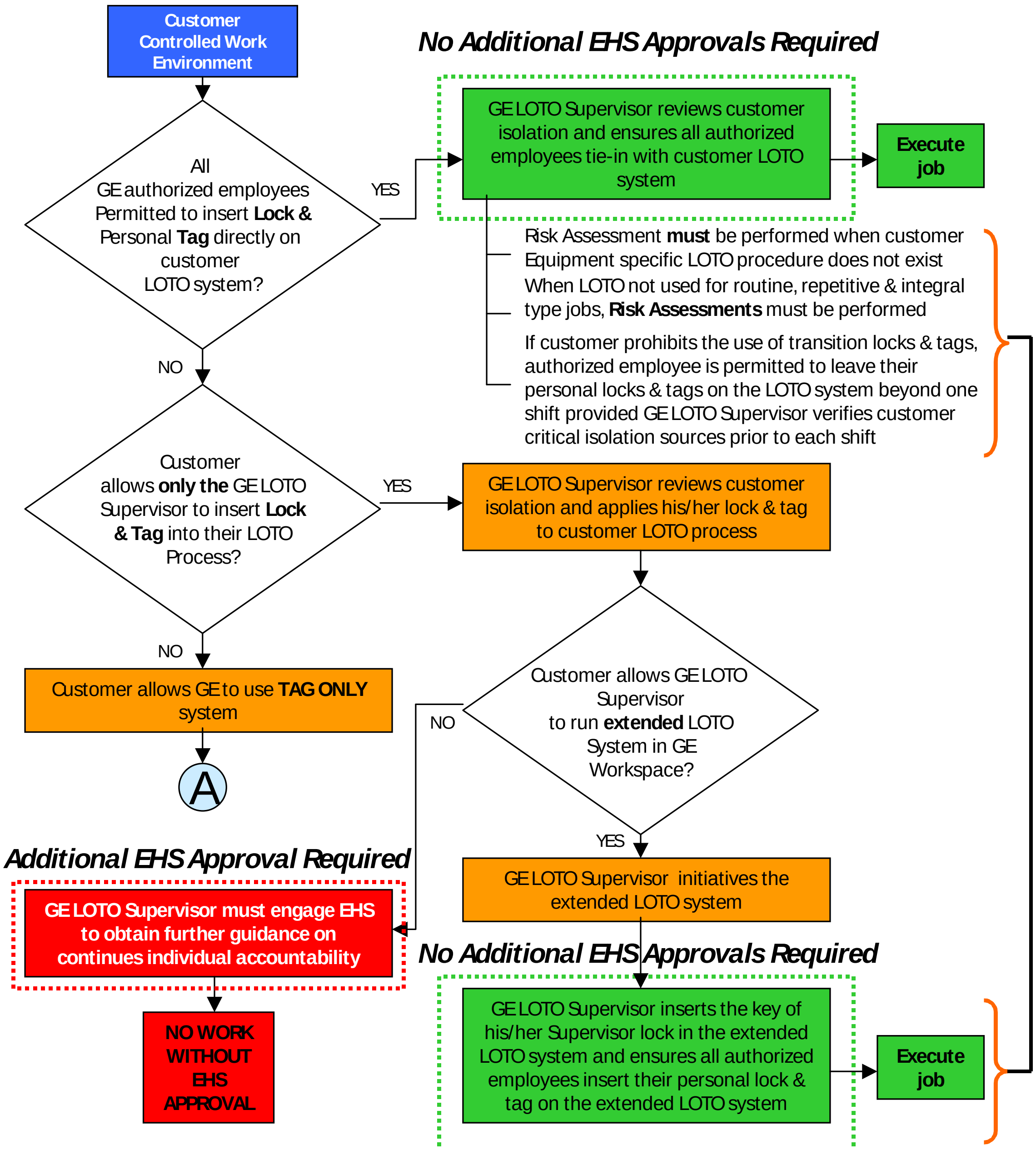
Multiple Locking Hasps



Lock Box

GROUP/ COMPLEX LOTO.. Approvals & Decision Tree

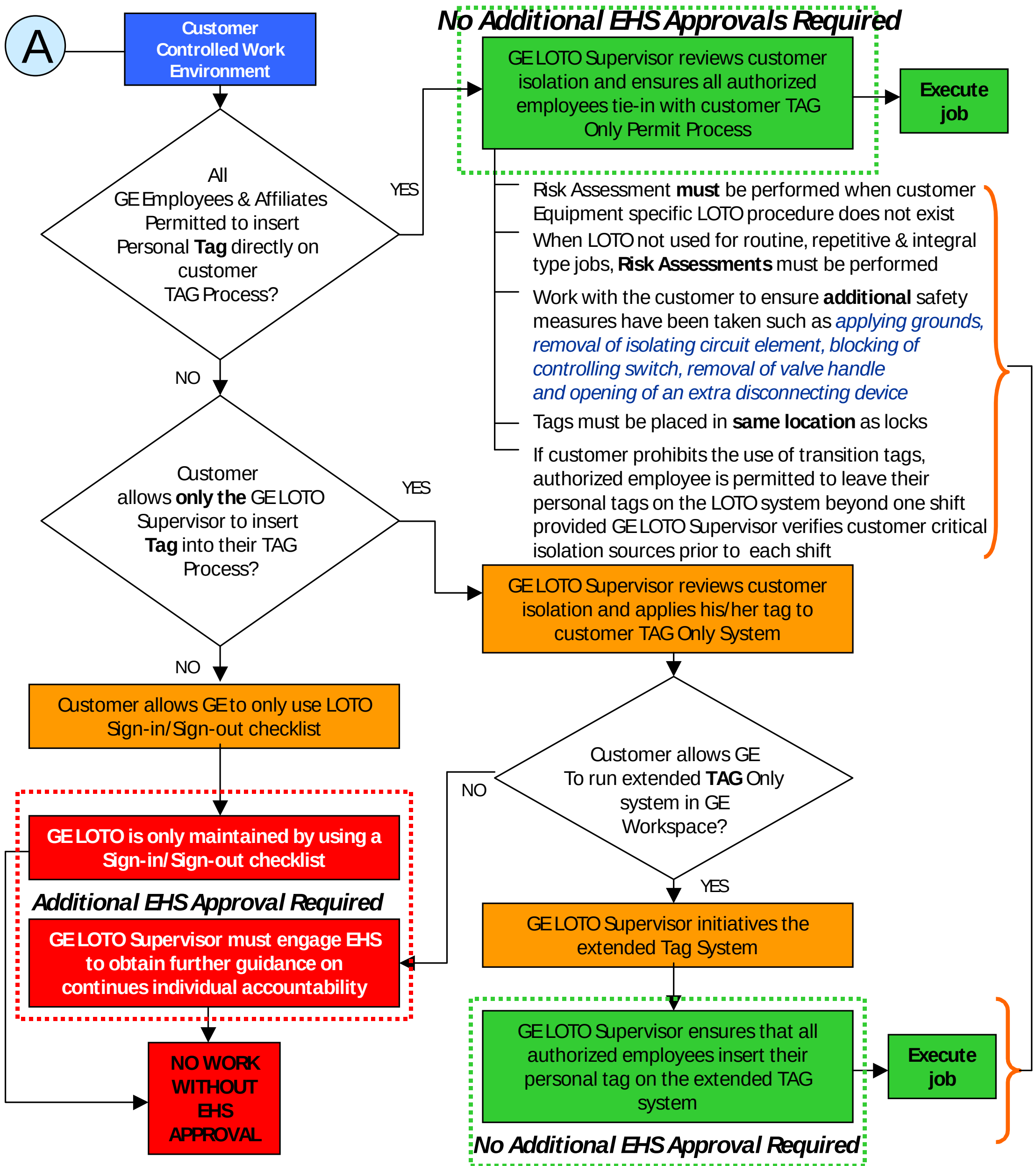
Customer sites where use of Lock AND TAG is permitted



*If at a site, customer allows the use of locks, GE LOTO Supervisor **must** ensure that all authorized employees have their own personal LOTO locks & tags*

Sites where customer uses TAG ONLY system

NOTE: If GE authorized employees are required to insert LOTO device directly on energy isolation device then US OSHA regulations require a use of **lock** if the system is capable of being locked out



*Proactively work with the customer rep to allow GE authorized employees to use their Personal **Lock & tag** in customer isolation permit system or **GE extended LOTO system***

APPENDIX D
ENERGY CONTROL PROGRAM INSPECTION REPORT FORM

(2 pages)

Department: ____________________ Equipment: ______________________________

Machine Number: ________________ Task Location: ____________________________

Date: ___/___/___ Shift: __________ Time: _____________________________AM/PM

Authorized person(s) name(s): Training?

____ Yes _____ No
____

____ Yes _____ No
____

____ Yes _____ No
____

____ Yes _____ No
____

Affected person(s) name(s): Training?

____ Yes _____ No
____

____ Yes _____ No
____

____ Yes _____ No
____

____ Yes _____ No
____

Were all affected persons notified of lockout?

Yes __ No ______ If yes, by whom ____

Name(s) of authorized/affected person(s) supervisor(s)

_____________________________ _________________________________

_____________________________ _________________________________

Written Lockout procedure available? (If yes, state where located)

Yes __ No ______ ____

Is lockout procedure being followed? ______Yes ______No

Is procedure posted? Yes _____ No ____

Is procedure in diagram form? Yes _____ No ____

Is procedure adequate? Yes _____ No ____

Has lockout been performed by all persons involved? _____Yes ______No
Was the equipment or process locked out? Yes ______ No _____
Name all required energy-isolating devices

______________________________ __________________________________

______________________________ __________________________________

______________________________ __________________________________

Can energy-isolating devices be locked out? Yes ______ No ______

Where blocks or pins are necessary, were they used? ____Yes _______No

Stage deficiencies requiring corrective action:

____

____

Did each authorized person lockout all required energy sources with their own locks? Yes _____ No ______

If not, what action was taken:

____

Did each authorized person verify lockout? _____ Yes _______ No

If not, what changes were needed:

____

CORRECTIVE ACTION(S) RECOMMENDED:

____

____

INSPECTION PERFORMED BY:

Date: ___/___/___ Time: ____AM/PM

APPENDIX E

SPECIAL CONSIDERATIONS FOR LOTO

E.1 FIELD SERVICES

E.1.1

For customer site work, field services personnel must request customer equipment specific LOTO Procedures but there is no requirement to convert customer document in GE format. If customers request GE field services personnel to develop equipment specific LOTO procedures then GE standard templates should be used unless customer requests site-specific format.

E.1.2

For customer site work under GE controlled work environment, field services personnel must have access to single keyed LOTO lock & tag and other LOTO devices such as cables, switches, etc to secure energy isolation sources. Sites where customer controls the work environment, field services personnel must have at a minimum access to single keyed LOTO lock & tag

E.1.3

Sites where customer controls the work environment and if the customer does not permit GE field services personnel to insert his/her lock & tag in the their LOTO system, then GE LOTO Supervisor must use extended LOTO system for ensuring an equivalent level of personal protection for each member of the group. Example of extended LOTO system: **Step 1:** GE LOTO Supervisor inserts his/her personal lock on the customer LOTO control system such as a lockbox, permit board, etc, **Step 2:** GE LOTO Supervisor then places the key in a lock box or other comparable device in GE workspace and applies the LOTO Supervisor lock to the device, **Step 3:** GE LOTO Supervisor then ensures that all GE affected employees & contractors place their individual LOTO locks & tags on the lock box, **Step 4: Each shift LOTO Supervisor verifies the LOTO**

E.2 GROUP VERIFICATION

Each authorized employee has the right to perform verification or observe the LOTO Supervisor perform verification. Except where prohibited by regulation, Authorized Employees also have the right to accept verification performed by the GE LOTO Supervisor on their behalf.

E.3 SINGLE SHIFT LOTO

For single shift LOTO guidelines, refer to Paragraph 5.2.7.

APPENDIX F

CUSTOMER LOTO PROGRAM EVALUATION CHECKLIST

(Example)

"Customer LOTO
Program Evaluatiojn (

(Double click above icon to open Excel file)

APPENDIX E

GE CONFINED SPACE MANUAL

Confined Space Manual

General Electric Company
Corporate Environmental Programs
Fairfield, Connecticut

November 2008

Table of Contents

Attachments

A - Example Confined Space Inventory

B - Example Permit Space Label

C - Example Permit Space Risk Assessment

D - Example Entry Permit

E - Example Customer Confined Space Program Checklist

F - Example Off-Site Rescue Service Evaluation

G - Example Contractor Program Checklist

H – Methods for Hazard Elimination or Mitigation

1. Scope and Application

1.1. This document presents GE's minimum global requirements for confined space entry operations, and must be complied with when they exceed local regulations. All operations are expected to be familiar with the regulatory requirements applicable to them, and to comply with those regulations where the requirements exceed those established by this Manual. Key areas where GE requirements may differ from local regulations include:

- 1.1.1. The distinction between confined space and permit space and the procedures required for each
- 1.1.2. Rescue requirements
- 1.1.3. Training requirements
- 1.1.4. Space Reclassification procedures

1.2. Businesses have the flexibility to determine how they will address the criteria presented in this document, but they must address all applicable requirements.

1.3. GE Businesses have the discretion to require more restrictive performance than specified in this manual. Contact your business level Health and Safety Leader to discuss your business's requirements.

1.4. Model forms and checklists in the document may be used as is, or redesigned/expanded to better-fit business needs, as long as the core content in the model forms is retained. Regulatory references from the U.S. and the U.K. were determined to be the best available practices and were used as primary references.

1.5. In the absence of regulatory specific guidance and where the guidance is less protective than that provided by this document, the GE requirements must be followed.

1.6. The highest levels of employee protection are required for permit space entry (see definition in Section 2), and because of the hazards present in permit spaces, Section 8.1 establishes that permit space entry must be a last resort after other options to complete the work have been found infeasible. Available methods to avoid permit space entry operations include the following:

- 1.6.1. Redesign or re-engineer the task so that permit space entry is not necessary (Example: develop a tool that can be used to collect a sample without entering the space, which is defined as breaking the plane of the permit space entry point with ANY PART of the body).
- 1.6.2. Determine whether the Alternate Entry Procedures in Section 10 apply.
- 1.6.3. Determine whether the space can be reclassified as confined space (non-permit space) using the procedures in Section 11.

2. **Definitions**

2.1. **Acceptable Entry Conditions** means the conditions that must exist in a permit space to allow entry and to ensure that employees involved can safely enter and work within the space

2.2. **Alternate Entry** means a permit space with only atmospheric hazards which can be controlled by only using forced air ventilation and atmospheric testing. Requires the partial completion of a entry permit

2.3. **Attendant** means an individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the GE permit space program

2.4. **Authorized Entrant** means an employee who is properly trained, competent and authorized by GE to enter a permit space

2.5. **Blanking or Blinding** means the absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate

2.6. **Confined Space** means a space that:

2.6.1. Is large enough and so configured that an employee can bodily enter and perform assigned work; and

2.6.2. Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, bins, hoppers, vaults, pits, and excavations are spaces that may have limited means of entry); and

2.6.3. Is not designed for continuous employee occupancy

2.7. **Double Block and Bleed** means the closure of a line, duct, or pipe by closing and locking two in-line valves and by opening and locking a drain or vent valve in the line between the two closed valves

2.8. **Emergency** means any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants

2.9. **Engulfment** means the surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing

2.10. **Entry** means the action by which a person passes through an opening into a permit space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space

2.11. **Entry Permit** means the written or printed document that is provided by GE to allow and control entry into a permit space

2.12. **Entry Supervisor** means the person (such as the foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this section

2.13. **Field Calibrating** means the testing instrument is shown calibration gas and the user verifies that the reading is within a predefined amount. Oxygen is calibrated to 21% oxygen in clean ambient air.

2.14. **Hazardous Atmosphere** means an atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness

2.15. **Hot Work Permit** means GE's written authorization to perform operations (for example, riveting, welding, cutting, burning, grinding and heating) capable of providing a source of ignition

2.16. **Immediately Dangerous to Life or Health (IDLH)** means any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space

2.17. **Inerting** means the displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible. This procedure produces an IDLH oxygen-deficient atmosphere

2.18. **Isolation** means the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout of all sources of energy; or blocking or disconnecting all mechanical linkages

2.19. **Line Breaking** means the intentional disconnection of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury

2.20. **Oxygen-deficient atmosphere** means an atmosphere containing less than 19.5 percent oxygen by volume

2.21. **Oxygen-Enriched Atmosphere** means an atmosphere containing more than 23.5 percent oxygen by volume

2.22. **Permit** Space means a space meeting the definition of a confined space in Section 2.6 that also has one or more of the following characteristics:

2.22.1. Contains or has a potential to contain a hazardous atmosphere

2.22.2. Contains a material that has the potential for engulfing an entrant

2.22.3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section

2.22.4. Contains any other recognized serious safety or health hazard. Serious safety and health hazards include the potential to cause any one of the conditions listed below:

2.22.4.1. Disabling injuries that would prevent self-rescue by the employee

2.22.4.2. Permanently disabling injuries or non-curable conditions

2.22.4.3. Amputation

2.22.4.4. Death

The mere presence of physical or mechanical hazards does not require a confined space to be classified as a permit space. The Entry Supervisor or qualified EHS representative must evaluate the hazards and determine whether they meet the criteria in 2.22.4.1 through 2.22.4.4. ADDITIONALLY, Section 11 allows permit spaces to be reclassified as confined spaces if all hazards are eliminated.

2.23. **Permit-Required Confined Space Program** (permit space program) means GE's overall program for controlling and protecting employees from, permit space hazards and for regulating employee entry into permit spaces

2.24. **Prohibited Condition** means any condition in a permit space that is not allowed by the permit prior to entry or during the period when entry is authorized

2.25. **Risk Assessment** means a process to identify and evaluate physical, chemical and biological hazards to prospective entrants, and develop the means to control those hazards

2.26. **Rescue Service** means the personnel designated to rescue employees from permit spaces

2.27. **Retrieval System** means the equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device appropriately anchored) used for non-entry rescue of persons from permit spaces

2.28. **Testing** means the process by which the hazards that may confront entrants of a permit space are identified, evaluated and documented

2.29. **Hazard Elimination** means removal of the hazard from the confined space. Methods to eliminate hazards include but are not limited to line breaking, blanking, physical electrical disconnection such as disconnecting wiring, removal of flowable materials from the space, electrical mechanical LOTO using GE Master LOTO Procedures, or other similar procedures.

2.30. **Hazard Mitigation** means the use of established GE procedures which have been determined to be of sufficient reliability to be the basis for potential reclassification of permit spaces to confined (non-permit) spaces, except where prohibited by regulation. Methods accepted for hazard mitigation are strictly limited to those listed under the Hazard Mitigation section of Attachment H to this document.

In the US, OSHA has issued interpretive guidance that for flowable hazards, LOTO does NOT constitute elimination of the hazard but is considered Hazard Control. Hazard Control does NOT allow a permit space to be reclassified as a non-permit space.

2.31. **Hazard Control** means the implementation of safety practices and equipment not meeting the definition of Hazard Elimination or Mitigation. These methods are NOT allowed as the basis for reclassification of permit spaces to non-permit.

2.32. **MOC means Management of Change.**

3. Roles and Responsibilities

3.1. Business-Level EHS

3.1.1. Provide guidance to operations/regions in determining if a space is Confined or Permit Space

3.1.2. Support operations/regions in development of location-specific Permit Space Program

3.1.3. Provide guidance on monitoring result interpretation, as requested to support the site operations

3.1.4. Audit programs to ensure compliant with regulatory and company requirements

3.2. Manager

3.2.1. Commit the resources necessary to develop and implement a Permit Space Program

3.2.2. Identify individuals who meet the specific requirements to be an Entry Supervisor

3.2.3. Verify that employees are completely trained for Permit Space operations prior to engaging in entry operations, and that refresher training is completed in a timely manner

3.2.4. Verify that only qualified instructors provide Permit Space Entry training. Qualified instructors have experience and training in Confined Space Entry operations, carry a CIH or CSP registration, or are approved by the Business H&S Leader

3.2.5. Verify that all necessary personnel adhere to all of the requirements listed in this procedure

3.2.6. Take appropriate disciplinary action for any violation of the Permit Space Entry Procedure

3.2.7. Assign an individual within each project to act as the project Entry Supervisor.

3.3. EHS Representative/ Confined Space Coordinator

3.3.1. Develop and maintain an inventory of Permit Spaces (Appendix A)

3.3.2. Verify that all authorized employees are trained on the Permit Space Program

3.3.3. Verify that all affected employees are made aware of permit spaces and their hazards

3.3.4. Conduct auditing of program to ensure compliance

3.3.5. Periodically review completed/cancelled permits to ensure compliance and identify lessons learned

3.3.6. Develop appropriate Emergency Response plans and capabilities

3.3.7. Ensure monitoring and emergency response equipment is in compliance with applicable regulation/standards

3.4. Entry Supervisor

3.4.1. Knows the hazards that may be faced during entry, including information on the mode of entry into the body, signs or symptoms, and consequences of the exposure

3.4.2. Verifies that appropriate entries have been made on the entry permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin

3.4.3. Terminates the entry and cancels the permit as required

3.4.4. Verifies that rescue services are available and that the means for summoning them are operable

3.4.5. Prohibits entry of unauthorized individuals who attempt to enter the permit space during entry operations

3.4.6. Determines that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained whenever responsibility for a permit space operation is transferred and at intervals dictated by the hazards and operations performed within the space.

3.5. Permit Space Entrants

3.5.1. Know the hazards that may be faced during entry, including information on the mode of entry into the body, signs or symptoms, and consequences of the exposure

3.5.2. Properly use equipment as required

3.5.3. Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space

3.5.4. Alert the attendant whenever:

3.5.4.1. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation

3.5.4.2. The entrant detects a prohibited condition

3.5.5. Exit from the permit space as quickly as possible whenever:

3.5.5.1. An order to evacuate is given by the attendant or the entry supervisor

3.5.5.2. The entrant recognizes any warning sign or symptom of exposure to a dangerous situation

3.5.5.3. The entrant detects a prohibited condition

3.5.5.4. An evacuation alarm is activated

3.6. Permit Space Attendants

3.6.1. Knows the hazards that may be faced during entry, including information on the mode of entry into the body, signs or symptoms, and consequences of the exposure

3.6.2. Is aware of possible behavioral effects of hazard exposure in authorized entrants

3.6.3. Continuously maintains an accurate count of authorized entrants in the permit space and ensures that the means used to identify authorized entrants accurately identifies who is in the permit space

3.6.4. Remains outside the permit space during entry operations until relieved by another attendant

3.6.5. Communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space

3.6.6. Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions;

3.6.6.1. If the attendant detects a prohibited condition

3.6.6.2. If the attendant detects the behavioral effects of hazard exposure in an authorized entrant

3.6.6.3. If the attendant detects a situation outside the space that could endanger themselves or the authorized entrants

3.6.6.4. If the attendant cannot effectively and safely perform all the duties required

3.6.7. Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards

3.6.8. Performs non-entry rescues as specified by the rescue procedure

3.6.9. Performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

3.7. Rescue Team

3.7.1. Participate in training and drills

3.7.2. Respond immediately to rescue calls from the Attendant or any other person recognizing a need for rescue from the confined space

3.7.3. Have current certification in first-aid and CPR

4. Identification/Classification

4.1. Each business must identify all spaces that meet the definition of a Confined Space and list them on an inventory (Attachment A). This excludes non-GE facilities not under operational control by GE. Field service operations should inventory the types of spaces they can reasonably anticipate entering.

4.2. The Confined spaces identified must then be evaluated to determine if they meet the requirements of a Permit Space

4.3. The inventory shall include the location of the space, it's classification (confined or permit) and reasoning for its classification. Field service operations do not need to complete the location of spaces at non-GE facilities not under operational control by GE, but are required to enter the expected space classification. Some spaces may be expected to be confined spaces or permit spaces depending on the operations conducted. This should be noted in the inventory.

4.4. Any new spaces that have not been classified (confined or permit) shall be handled as a permit space until reviewed

4.5. The inventory shall be communicated and made readily available to employees

4.6. A space must be evaluated or reevaluated to verify it's classification (confined or permit space) where a Management of Change (MOC) identifies a possible change to the space.

4.7. Annually, a review of the list should be done to verify all spaces have been identified

4.8. If your location does not identify any confined spaces then documentation of the assessment must be kept and no written permit space program is required.

4.9. If your location has only confined spaces or has both confined and permit spaces but decides that its employees will not enter permit spaces, you must take effective measure to prevent employees and contractors from entering the permit spaces and develop a written Permit Space Program that is available to employees and covers the following sections of this manual:

- 4.9.1. Scope and Application
- 4.9.2. Definitions
- 4.9.3. Roles and Responsibilities
- 4.9.4. Identification/Classification
- 4.9.5. Confined Spaces
- 4.9.6. Labeling of Permit Spaces
- 4.9.7. Training (Awareness Only)
- 4.9.8. Contractors

4.10. If your business decides that its employees will enter permit spaces (Alternate, Reclassification or Entry Permitting) you must develop and implement a written Permit Space Program that is available to employees and complies with all parts of this manual.

4.11. The location must consult with and make information available to affected employees on the development and implementation of all aspects of the Permit Space Program.

5. Confined Spaces

5.1. Those spaces classified as Confined Spaces, as apposed to permit spaces, have no further work restrictions applied to them and are not covered by any further requirements of this manual.

5.2. If classification of a space as confined space requires entry to complete the evaluation, such entry must be made following permit space entry procedures.

5.3. The Risk Assessment required by this manual for permit spaces may be required for all confined spaces by country-specific regulations. Each location must review their program against local regulations to verify compliance.

6. **Labeling of Permit Spaces**

6.1. If permit spaces are present at the facility, you must inform potentially exposed employees of the existence and location of and the danger posed by the permit spaces. This may be accomplished by posting danger signs (Attachment B) or by any other equally effective means.

6.2. Signs must be in the local language(s) such that all affected employees can understand the postings.

6.3. Signs should be maintained in a legible condition

6.4. The signs should contain a warning that a permit is required before entry

6.5. Access locations for all permit spaces should be labeled

7. **Permit Space Risk Assessment**

7.1. Permit spaces must have a risk assessment completed prior to entering the space. The risk assessment may be completed as:

7.1.1. As a stand-alone document (Regulatory required in some countries) or

7.1.2. As part of the entry permitting process

7.2. It is recommended that all known permit spaces receive a stand-alone assessment that is used to assist in the issuing of an entry permit. A Permit Space Risk Assessment (Attachment C) is provided for completing stand-alone assessments.

7.3. Either type of risk assessment should identify the typical work that is performed in the permit space, the specific hazards known or anticipated, and the control measures to be implemented to eliminate or reduce each of the hazards to an acceptable level as well as the emergency arrangements that must be made before work starts

7.4. No entry permit shall be issued until the risk assessment has been reviewed and discussed by all persons engaged in the activity. Personnel who enter confined spaces must be informed of known or potential hazards associated with the permit spaces to be entered.

7.5. The stand-alone risk assessment for a space must be developed or re-evaluated if a MOC is implemented that might result in a possible change to the space.

8. **Entry - Last Resort**

8.1. Entry into permit spaces may only be considered when all other options for completing the task have been explored and deemed infeasible

8.2. Whenever feasible, operations should be done remotely, or equipment and procedures should be modified to eliminate the need for employees or contractors to enter any permit space

8.3. Whenever feasible, design and construction of facilities and systems, equipment purchase and installation should consider the elimination of all permit spaces that could require entry for maintenance, inspection, or testing

8.4. Where feasible, work involving permit spaces is to be planned so that entry is avoided. Some suggestions for entry avoidance are:

8.4.1. Modify the permit space so that entry is not necessary
8.4.2. Modify the permit space so that it no longer meets the definition of a permit space
8.4.3. Perform the work from the outside - e.g. inspections, sampling and cleaning operations can be carried out using appropriate equipment and tools.

9. Permit Space Entry Options

9.1. Entry requirements for Permit Spaces are dependant upon the hazards and controls measures available. The entry methods include:

9.1.1. Alternate Entry Procedure

9.1.2. Reclassification Entry Procedure

9.1.3. Permit Space Entry Procedure

9.1.3.1. IDLH Space Precautions

10. Alternate Entry Procedure

10.1. These entry procedures can only be used when a permit space has only an actual or potential Atmospheric Hazard and it can be demonstrated that continuous forced air ventilation alone is sufficient to maintain that permit space safe for entry.

10.2. Initial atmospheric testing data is required to demonstrate ventilation alone is sufficient. If an employee must enter the space to conduct atmospheric testing, then Permit Space Entry Procedures must be followed

10.3. The forced air ventilation must be directed as to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees have left the space

10.4. The air supply for the forced air ventilation shall be from a clean source and may not increase the hazards in the space

10.5. There must be no hazardous atmosphere inside the space before any authorized entry

10.6. The Entry Permit must be completed up to the Alternate Entry Procedure Section (Attachment D) and must be signed by an entry supervisor and communicated to entry employees

10.7. The atmosphere within the space shall be periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere. Any employee who enters the space must be provided with an opportunity to observe the periodic testing

10.8. If a hazardous atmosphere is detected during entry:

10.8.1. Each employee shall leave the space immediately

10.8.2. The space shall be evaluated to determine how the hazardous atmosphere developed; and

10.8.3. Measures shall be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place

10.8.4. Re-entry into the space must follow Permit Space Entry Procedures

11. Reclassification Entry Procedure

11.1. If all atmospheric and/or physical/mechanical hazards in the permit space can be eliminated or mitigated (not controlled), the permit space may be reclassified as a Confined Space for the entry. Methods to eliminate or mitigate hazards are discussed in Attachment H.

11.2. If it is necessary to enter the permit space to eliminate or mitigate hazards, employees must follow the Permit Space Entry Procedure. If testing and inspection during that permit entry demonstrate that the hazards within the permit space have been eliminated or mitigated, the entry may be reclassified as a Confined Space for as long as the hazards remain eliminated or mitigated.

11.3. If forced air ventilation is required to control atmospheric hazards then reclassification is not allowed and space must be entered using Alternate Entry (if atmospheric hazard is the only hazard) or Permit Space Entry Procedures

11.4. The Entry Permit must be completed up to the Reclassification Section (Attachment D) and must be signed by an Entry Supervisor and communicated to entry employees

11.5. If hazards are detected during the entry:

11.5.1. Each employee in the space shall exit immediately

11.5.2. The space shall be evaluated to determine how the hazards developed and

11.5.3. Implement measures to protect employees from the hazards before any subsequent entry takes place

11.5.4. Re-entry into the space must follow Permit Space Entry Procedures

12. Permit Space Entry Procedure

12.1. Permit Space Entry Procedures typically follow these steps:

12.1.1. Notification is made that permit space entry in required

12.1.2. Trained Entry Supervisor, Entrant(s) and Attendant(s) are identified

12.1.3. Space is prepared for evaluation

12.1.4. Entry Supervisor uses Risk Assessment and/or Entry Permit to identify actual or potential hazards, controls and emergency response preparations

12.1.5. If IDLH conditions are identified, entry into the space must be reviewed and approved by Business Level H&S Team

12.1.6. Entrant(s) and Attendant implement controls

12.1.7. Atmospheric Testing is conducted and determination made if additional controls needed

12.1.8. Entry Supervisor, Entrant(s) and Attendant(s) conduct pre-entry briefing to review Atmospheric Testing (Required), Entry Permit (Required) and Risk Assessment (if available)

12.1.9. Completed Entry Permit is posted at or near permit space entrance

12.1.10. Work begins with Entry Supervisor periodically checking in on the site and ensuring periodic atmospheric testing is being done

12.1.11. Once work is completed, Entrant(s) remove all tools, equipment and begins permit space back to normal

12.1.12. Entry Supervisor conducts a final review of area to ensure all controls have been removed, required communication made and space is safe to return to normal

12.1.13. Entry Supervisor documents on Entry Permit when permit is cancelled and follows locations document control procedure to maintain permit

12.2. The following sections of this manual have been developed to provide further detail concerning the Permit Space Entry Procedure:

12.2.1. Entry Permit

12.2.2. Hazard Identification/Control

12.2.3. Atmospheric Testing

12.2.4. IDLH Space Precautions

12.2.5. Rescue and Emergency Services

12.2.6. Contractors

12.2.7. Training

13. **Entry Permit**

13.1. The Entry Permit (Attachment D) is the tool that identifies and documents safe working conditions during entry into permit spaces with known hazards or with unknown or potentially hazardous atmospheres. A business can design a business-specific Entry Permit as long as it meets all of the criteria listed in section 13.4.

13.2. Before each entry into a permit space, the Entry Supervisor must complete an entry permit

13.3. The entry permit guides the Entry Supervisor and workers through a systematic evaluation of the space to be entered. The permit establishes appropriate conditions for entry and work in the space.

13.4. The entry permit must contain the following items:

13.4.1. The permit space to be entered

13.4.2. The purpose of the entry

13.4.3. The date and the authorized duration of the entry permit

13.4.4. The authorized entrants within the permit space, by name or by such other means (for example, through the use of rosters or tracking systems) as will enable the attendant to determine quickly and accurately, for the duration of the permit, which authorized entrants are inside the permit space

13.4.5. The personnel, by name, currently serving as attendants

13.4.6. The individual, by name, currently serving as entry supervisor, with a space for the signature or initials of the entry supervisor who originally authorized entry

13.4.7. The hazards of the permit space to be entered

13.4.8. The measures used to isolate the permit space and to eliminate or control permit space hazards before entry. NOTE: Those measures can include the lockout of equipment and procedures for purging, inerting, ventilating, and flushing permit spaces

13.4.9. The acceptable entry conditions

13.4.10. The results of initial and periodic atmospheric testing accompanied by the names or initials of the testers and by an indication of when the tests were performed

13.4.11. The rescue and emergency services that can be summoned and the means (such as the equipment to use and the numbers to call) for summoning those services

13.4.12. The communication procedures used by authorized entrants and attendants to maintain contact during the entry

13.4.13. The equipment required for the entry, such as personal protective equipment, testing equipment, communications equipment, alarm systems, and rescue equipment

13.4.14. Any other information whose inclusion is necessary, given the circumstances of the particular permit space, in order to ensure employee safety

13.4.15. Any additional permits, such as hot work or customer entry permits, that have been issued to authorize work in the permit space.

13.5. An Entry Supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as required for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.

13.5.1. If an Entry Supervisor is going to serve as an entrant, it is recommended that the Entry Supervisor role be transferred to another qualified individual remaining outside the space

13.6. The duration of the entry permit may not exceed the time required to complete the assigned task or job identified on the permit and may not exceed one shift (e.g. 8 hrs). For a entry permit to be renewed, several conditions shall be met before each re-entry into the permit space:

13.6.1. Atmospheric testing shall be conducted and the results must be within acceptable limits

13.6.2. If atmospheric test results are not within acceptable limits, precautions to protect entrants against the hazards should be addressed on the permit and should be in place

13.6.3. The Entry Supervisor shall verify that all precautions and other measures called for on the permit are still in effect.

13.7. Only operations or work originally approved on the permit shall be conducted in the space. A new permit should be issued or the original permit revised and reissued whenever changing work conditions or work activities introduce new hazards into the space.

13.8. The permit requirements and the steps taken to fulfill those requirements must be communicated to all employees involved in the operation prior to entry operations

13.9. The completed permit must be posted conspicuously at or near permit space entrance

13.10. Each location must use a standard Entry Permit for all entries

13.11. When working at non-GE locations it is recommended that a Customer Confined Space Program Checklist (Attachment E) be completed to evaluate the customers permit space program against GE's requirements.

13.12. When working at a non-GE location where the owner/operator completes an entry permit, the GE entrant must complete a GE Entry Permit as a means to verify correct entry procedures are being followed. The GE entrant should observe the atmospheric testing performed by the owner/operator if it is to be used as the initial testing to enter the space, to verify the following:

13.12.1. Testing meets the minimum GE requirements in the Atmospheric Testing section of this Manual

13.12.2. The manufacturer calibration of the instruments used is verified as current, and

13.12.3. The field calibration is observed and done correctly

13.13. When working at non-GE locations, if it is determined that the owner/operator permit space entry procedures do not meet GE requirements and/or use of GE procedures is denied, entry is prohibited until EHS reviews and approves entry procedures that provide equivalent protection to GE procedures.

13.14. Each location must retain each cancelled entry permit for at least one year to facilitate the review of the program. Any problems encountered during an entry operation should be noted on the entry permit so that appropriate revisions to the program can be made.

13.15. Completed entry permits must be periodically reviewed for completeness and accuracy. It's recommended this review be done no later than 30 days after submittal of completed permit.

14. Hazard Identification/Control

14.1. The following hazards are common in permit spaces:

14.1.1. Lack of Oxygen - This can occur because other gases or vapors displace Oxygen or because Oxygen is consumed. Air in spaces that are closed for an extended period may become deficient in oxygen due to oxidation of metals or from biological activity.

14.1.2. Oxygen-Enriched Atmospheres - Oxygen content greater than 23 percent by volume increases fire hazard.

14.1.3. Flammable or Combustible Atmosphere - Gases, vapors and liquids may accumulate in the space or may be present as residues

14.1.4. Electric Shock or Ignition of Flammable/ Combustibles - Portable lights, tools, or associated electrical equipment may cause shock or ignition of gases and vapors.

14.1.5. Injury from Mechanical Equipment not initially controlled through LOTO - Pumps, mixers, conveyors, etc., inadvertently activated or unguarded

14.1.6. Temperature Extremes - Vessels with steam jackets could rapidly heat to an unsafe temperature and those with cooling or cryogenics could expose entrants to extreme cold. The equipment itself may be designed to have a temperature extreme as well.

14.1.7. Exposure to Hazardous Substances - This may result from gradual release of substances from sludge, scale or slow chemical reactions that, over time, allow significant gas or vapor concentrations to develop. Contaminants can also enter from other sources through ducts and piping not initially controlled through LOTO.

14.2. Hazards in and around permit spaces must be controlled. Controls include changes in the work processes and/or working environment with the objective of:

14.2.1. Eliminating hazards

14.2.2. Reducing hazards below harmful levels

14.2.3. Preventing the hazards from coming into contact with the workers

14.3. The Hierarchy of Controls should be followed in controlling confined space hazards:

14.3.1. Engineering controls, such as ventilation to limit exposure to hazards

14.3.2. Work practice controls, such as wetting of hazardous dusts, frequent cleaning, LOTO

14.3.3. Use of personal protective equipment such as air purifying or supplied-air respirators.

14.4. Engineering Controls

14.4.1. Engineering controls are those controls that eliminate or reduce the hazard through implementation of sound engineering practices.

14.4.2. Examples include: guarding, ventilation systems, etc.

14.5. Work Practice (Administrative) Controls

14.5.1. Work practice (administrative) controls are those controls that eliminate or reduce the hazard through changes in the work practice.

14.5.2. Examples include: Cleaning/decontamination of vessels, rotating of workers, LOTO, etc.

14.6. Personal Protective Equipment (PPE)

14.6.1. If the hazard cannot be eliminated or reduced to a safe level through engineering and/or work practice controls, PPE should be used.

14.6.2. The Entry Supervisor should determine PPE needed by all personnel entering the confined space, including rescue teams.

14.6.3. Examples include: Harness, Respirator, Gloves, etc.

14.7. Isolation of Hazardous Energy - Lockout / Tagout

14.7.1. All energy sources that could pose a hazard to an entrant in a permit space must be isolated (secured, relieved, disconnected and/or restrained) and verified to be at a zero active state before entering

14.7.2. In permit spaces where complete isolation is not possible, provisions must be made to isolate hazards to the maximum extent possible and the issue must be noted on the associated permit space risk assessment.

14.7.3. Special precautions should be taken when entering double walled, jacketed, or internally insulated permit spaces that may discharge hazardous material through the vessel's internal wall

14.7.4. Where there is a need to test, position or activate equipment by temporarily removing the lock, the requirements of the GE LOTO Procedure must be followed

14.8. Any conditions making it unsafe to remove an entrance cover or open an access door or panel must be eliminated before the space is opened.

14.9. Once open, the entry point must be promptly guarded by a railing or other temporary barrier that will prevent anyone from falling through the opening. This barrier should protect each employee working in the space from foreign objects entering the space. If the opening is located in a traffic area, adequate barriers should be erected

14.10. Means for safe entry and exit must be provided for permit spaces. Each entry and exit point should be evaluated to identify the hazards and select the most effective methods and equipment to enable employees to safely enter and exit the space.

14.11. All individuals involved with an entry must be provided with the appropriate equipment to meet the permit space conditions identified. All equipment should be tested for proper function and integrity prior to use. As appropriate, equipment should be intrinsically safe. Equipment may include, but not limited to:

- 14.11.1. PPE (Coveralls, chemical suits, head covering, hearing protection, respiratory protection, gloves, apron, footwear, or foot protection)
- 14.11.2. Ventilation Equipment – as needed to ensure acceptable entry conditions.
- 14.11.3. Communication Equipment – as needed to allow communication at all times between entrant and the attendant.
- 14.11.4. Lighting – as needed to allow entrant(s) to work safely and to exit the space quickly in an emergency.
- 14.11.5. Entry/Egress Equipment – ladders, hoists or other means to enter and exit the space.

14.12. To facilitate non-entry rescue, retrieval systems or methods must be used whenever an entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. The Entry Supervisor must make this decision.

14.13. Retrieval systems shall meet the following requirements.

- 14.13.1. Each entrant shall use a full body harness, with a retrieval line attached at the center of the entrant's back near shoulder level, above the entrant's head, or at another point which the Entry Supervisor determines presents a profile small enough for the successful removal of the entrant.
- 14.13.2. Wristlets may be used in lieu of the full body harness if Entry Supervisor can demonstrate that the use of a full body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative.
- 14.13.3. The other end of the retrieval line shall be attached to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary.
- 14.13.4. A mechanical device shall be available to retrieve personnel from vertical type permit spaces more than 5 feet (1.52 m) deep

14.14. If fall protection is necessary for entry into the space, and the equipment is involved in a fall or a rescue from a top-entry space, the equipment must be taken out of service. Consult the GE Fall Protection Manual for guidance.

15. Atmospheric Testing

15.1. Atmospheric testing is required prior to entry into any permit space to verify that acceptable conditions exist for entry into the space

15.2. If a person must go into the space to conduct the atmospheric testing, all Permit Entry Procedures (i.e., rescue team, attendant, entry supervisor) must be in place prior to entering.

15.3. The internal atmosphere must be tested with a calibrated, direct-reading instrument for the following, in the order given:

15.3.1. Oxygen content
15.3.2. Combustible gases and vapors
15.3.3. Carbon Monoxide
15.3.4. Toxic gases and vapors expected to be present in the space

15.4. Direct-reading instruments must be used for measuring Oxygen and Combustible gasses and vapor levels within a space and should be used for Carbon Monoxide, Toxic gases and vapor testing as well. The use of detector tubes for atmospheric testing of spaces should only be used when other options are not readily available.

15.5. Testing equipment used in specialty areas should be listed or approved for use in such areas. This listing or approval should be from nationally recognized testing laboratories such as Underwriters Laboratories or Factory Mutual Systems.

15.6. The atmosphere of a permit space should be analyzed using equipment of sufficient sensitivity and specificity.

15.7. The analysis should identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry procedures can be developed and acceptable entry conditions stipulated for that space. Testing, evaluating and develop appropriate control measures must be done by a person trained in Atmospheric Testing

15.8. Testing results must be documented on the Entry Permit

15.9. The atmosphere must be periodically retested to verify that atmospheric conditions remain within acceptable entry parameters when a potential for a hazardous atmosphere exists.

15.10. If the permit space is vacated for any period of time, the atmosphere of the space must be retested before re-entry is permitted.

15.11. The atmosphere of a permit space should be considered within acceptable limits whenever the following conditions are maintained:

15.11.1. Oxygen - 19.5% to 23.5%

15.11.2. Flammability - less than 10% of the Lower Explosion Limit (LEL), also know as the Lower Flammable Limit (LFL)

15.11.3. Carbon monoxide - less than 25 ppm (or lower if required by local regulation)

15.11.4. Toxic Materials - less than recognized published exposure levels using the established GE priority of the lowest or most protective limit among the following: ACGIH Threshold Limit Values, local regulatory occupational exposure limits, or GE-specified occupational exposure limits

15.12. Whenever atmospheric testing levels are not within acceptable limits, entry shall be prohibited until appropriate controls are implemented, and re-testing indicates the levels are within acceptable levels or appropriate personal protective equipment is identified and used to protect workers. If this is unable to occur or atmospheric testing levels exceed IDLH levels listed in the *NIOSH Pocket Guide to Chemical Hazards* (available on the GE IH SupportCentral community: http://supportcentral.ge.com/products/sup_products.asp?prod_id=27882) or similar reference, the space must be classified as IDLH and those additional precautions must be implemented before entering.

15.13. If the source of the contaminant cannot be determined or controlled, corrective actions must be adequate to deal with the worst possible condition in the permit space and continuous atmospheric monitoring must be conducted

15.14. If there is the possibility that the permit space atmosphere can become unacceptable while the work is in progress, the atmosphere should be constantly monitored and procedures and equipment should be provided to allow the employees to quickly and safely exit the space

15.15. Testing of spaces with Top Entrances should follow this process:

15.15.1. From each entrance, drop the sampling probe of the meter to the bottom of the space. Additionally, use other available openings, which would facilitate air testing for that permit space

15.15.2. Slowly raise the sampling probe, stopping at intervals of three feet (1 meter) to verify that the atmosphere is not contaminated. The rate of sampling should be slowed to accommodate detector response due to the length of the sampling line

15.15.3. Record atmospheric testing data on the entry permit

15.16. Testing of spaces having a Side or Bottom Entrance should follow this process:

15.16.1. From each entrance, move the sampling probe to the opposite side of the space. Use rods, poles or other means to extend the probe to the opposite side of the space

15.16.2. Slowly test all areas inside the permit space. The rate of sampling must be slowed to accommodate detector response due to the length of the sampling line and probe

15.16.3. Record air testing data on the confined space permit

15.17. All equipment used for atmospheric testing must be maintained according to manufacturer's recommendations and factory calibrated at the required frequency

15.18. All testing equipment must have its calibration checked immediately prior to use. The calibration checks must be performed in accordance with the manufacturer's requirements and should include:

15.18.1. Fresh air check (Oxygen)

15.18.2. Zero check (CO, LEL, etc.)

15.18.3. Span check (LEL, VOCs, CO)

15.19. Instrument calibration documentation will be reviewed annually.

15.20. Instruments failing calibration must not be used, and must be taken out of service and repaired or replaced

16. **IDLH Space Precautions**

16.1. Entry into permit spaces containing an IDLH atmosphere is <u>prohibited</u> unless the proposed entry receives prior review and approval from the business level health & safety leader or industrial hygienist, and specific entry procedures are established.

16.2. Respirators for IDLH atmospheres must be:

16.2.1. A certified full facepiece pressure demand SCBA for a minimum service life of thirty minutes, or

16.2.2. A combination full facepiece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply

16.3. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

16.4. Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the attendant

16.5. The emergency rescue services are on standby outside the permit space

16.6. The emergency rescue operations must be equipped with at least:

16.6.1. Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied-air respirator with auxiliary SCBA; and

16.6.2. Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres

17. **Rescue and Emergency Services**

17.1. If permit spaces are to be entered at a location, emergency rescue plans must be developed

17.2. Entry rescue personnel and equipment are required to be able to respond and arrive at the location of the permit space entry whenever the permit space contains hazards capable of causing serious accidents such as those involving falls, suffocation, asphyxiation, electrocution, amputation, or similar serious hazards. When a qualified Entry Supervisor or qualified EHS representative determines that a permit space does not present serious hazards triggering the requirement of 4-minute entry rescue response time, the rationale for this determination <u>must</u> be documented on the GE Entry Permit. Examples of permit spaces that may not require 4-minute entry rescue response time include:

17.2.1. **<u>Sewer lift station</u>** with built in power ventilation system considered designed for human occupancy. The definition is clear for those spaces where a known or suspect hazard is considered and eliminated or controlled in the design of a workplace. When hazards are eliminated and/or managed through the application of engineering controls for the safety and health of the humans who will be occupying the space, the employee protective measures, intended by the standard, have been met. Where it can be shown that the manufacturer has considered the hazards of sewage and its by-products in the design of their pump station so humans can work in the space. Design measures such as barrier separation from the sewage, powered ventilation providing a minimum of 20 air changes an hour, automatic-on and timed (ventilation) control, lighting and even optional heating or air conditioning demonstrates that this unit was designed to accommodate the worker who will enter it.

17.3. When 4-minute response time is required, on-site rescue teams, off-site local services or a contracted service may be used for entry rescue. Whichever rescue service is selected, they must to able to respond and arrive at the location of the permit space entry within 4 minutes of being called.

17.4. Attachment F (or equivalent) must be completed when evaluating off-site or contracted rescue services. This document shall also be used when GE employees are relying on customer or site owner/operator entry rescue services.

17.5. If an outside rescue service is used, they:

17.5.1. Must be made aware of the hazards of the permit spaces

17.5.2. Must have access to comparable permit spaces or afforded the opportunity to practice at the location where they will be doing a possible rescue in order to develop rescue plans

17.5.3. Should conduct an annual drill on-site as part of the agreement

17.6. If the location selects on-site rescue services then the following measures must be taken:

17.6.1. Provide affected employees with the personal protective equipment (PPE) needed to conduct permit space rescues safely and train affected employees so they are proficient in the use of that PPE, at no cost to those employees

17.6.2. Train affected employees to perform assigned rescue duties. The employer must ensure that such employees successfully complete the training required to establish proficiency as an authorized entrant

17.6.3. Train affected employees in basic first-aid and cardiopulmonary resuscitation (CPR). At least one member of the rescue team holding CPR certification must be available but it is recommended that at least two available members are CPR certified

17.6.4. Ensure that affected employees practice making permit space rescues at least once every 12 months, by means of simulated rescue operations in which they remove dummies, manikins, or actual persons from the actual permit spaces or from representative permit spaces.

17.6.5. Representative permit spaces shall, with respect to opening size, configuration, and accessibility, simulate the types of permit spaces from which rescue is to be performed.

17.7. Rescue services must be coordinated ahead of time. Coordination must include contacting the rescue service and alerting them to the entry schedule, and verifying that trained personnel (minimum of 2 or more rescuers other than the Attendant is recommended) and necessary equipment are available during the period of entry, and can respond to the location of the entry within the required 4 minute timeframe.

17.8. If permit space has a IDLH condition, rescue services must be on stand-by outside the permit space with necessary rescue equipment

17.9. A method for contacting the emergency and rescue services must be clearly identified on the entry permit and communicated to the Attendant

17.10. If an injured entrant is exposed to a substance for which a Material Safety Data Sheet (MSDS) or other similar written information is required to be kept at the worksite, that MSDS or written information shall be made available to the medical facility treating the exposed entrant

18. **Contractors**

18.1. A GE contractor representative is designated for each contractor in accordance with Element 10 of the GE Health and Safety Framework. This representative is responsible for the overall safety and health coordination and oversight of the contractor, as well as the interaction of the contractor with GE employees.

18.2. The GE representative must:

18.2.1. Inform the contractor that the workplace contains permit spaces and that entry is allowed only through compliance with a Permit Space Entry Program

18.2.2. Apprise the contractor of the elements, including the hazards identified and the host employer's experience with the space, that make the space in question a permit space. If available, the risk assessment should also be shared

18.2.3. Apprise the contractor of any precautions or procedures that GE and the host employer have implemented for the protection of employees in or near permit spaces where contractor personnel will be working

18.2.4. Review the permit space program the contractor intends to follow and training certifications for entrants/attendants and rescue team. The Contractor Program Checklist, Attachment G, can be used to assist in conducting the review.

18.2.5. Coordinate entry operations to ensure the GE Permit Space Program is followed when both GE and contractor personnel will be working in or near permit spaces

18.2.6. Debrief the contractor at the conclusion of the entry operations regarding the permit space program followed and regarding any hazards confronted or created in permit spaces during entry operations

18.2.7. For field service operations, field engineers, field technicians, or sales personnel may be designated as the GE representative to oversee the contractor as long as they are qualified to fulfill these duties.

18.3. Contractor employees involved in permit space entry activities must be trained according to their role and level of responsibility. Training must be in accordance with the applicable regulatory requirements and the Contractor's Confined Space Entry program, as accepted following the review required by Element 10 of the GE Health & Safety Framework.

18.4. Contractors are required to submit copies of employee applicable training records (e.g., confined space entry, LOTO, asbestos removal, etc.).

18.5. Periodic H&S inspections should be done to verify contractors are complying with entry requirements. When safety-related problems are noted the GE representative has the authority to stop work until the problems are corrected.

18.6. GE has the right to terminate the contract for safety violations. All cost associated to this termination shall be the responsibility of the contractor. These terms are to be included in all contracts.

18.7. Contractors should have their own equipment and calibrated multi-gas meter to perform ongoing air monitoring and during the entry. Contractors should not be using GE's safety equipment.

19. **Training**

19.1. All persons providing Permit Space Entry training must have documented training and experience in each specific subject that they present, as approved by the business level EHS team. An example of a qualified permit space entry instructor would be a qualified Entry Supervisor with good verbal communications skills.

19.2. Each GE location must provide Confined Space Awareness Training, MyLearning EHS-190 can be used, to all employees whose work may be affected by confined spaces or entry activities. The training must cover:

19.2.1. The existence of confined and permit spaces in their work areas

19.2.2. Labeling methods and warnings

19.2.3. Understand the dangers of unauthorized entry

19.3. Each GE location must provide training so that all employees whose work involves dealing with permit spaces acquire the understanding, knowledge, and skills necessary for the safe performance of their duties. Training should be provided to each affected employee:

19.3.1. Before the employee is first assigned duties

19.3.2. Before there is a change in assigned duties

19.3.3. Whenever there is a change in permit space operations that presents a hazard for which an employee has not been trained

19.3.4. Whenever GE has reason to believe either that there are deviations from the permit space entry procedures or that there are inadequacies in the employee's knowledge or use of these procedures.

19.4. Training for Entry Supervisors should include:

19.4.1. Duties and responsibilities as a member of the permit space entry team

19.4.2. Explanation of the general hazards associated with confined and permit spaces

19.4.3. Discussion of specific permit space hazards associated with the site, location or operation

19.4.4. Reason for, proper use, and limitations of PPE and other safety equipment required for entry into permit spaces

19.4.5. Explanation of permits and other procedural requirements for conducting a permit space entry

19.4.6. A clear understanding of what conditions would prohibit entry

19.4.7. Understanding of what emergency equipment/preparations are required and how to respond to emergencies

19.4.8. Description of how to recognize symptoms of overexposure to probable air contaminants in themselves and co-workers, and method(s) for alerting attendants

19.4.9. Other training may be required for the Entry Supervisor if the permit space dictates a need. Other training may include but is not limited to: LOTO Authorized, Electrical Safety, Fall Protection, etc.

Training for Entry Supervisors	**GE Course**
Confined Space Entry Supervisor Training	Minimum of MyLearning, EHS-200 plus the following: Instrumentation training, Non-Entry Rescue, Summoning Entry Rescue Service, Communication with Entrants

19.5. Training for Atmospheric Testing Personnel should include:

19.5.1. Proper use of the equipment

19.5.2. Knowledge of calibration

19.5.3. Knowledge of sampling strategies and techniques

19.5.4. Knowledge of Occupational Exposure Limits, TLVs, LELs, UELs, etc.

19.5.5. Other training may be required for Atmospheric Testing Personnel if the permit space dictates a need. Other training may include but is not limited to: LOTO Authorized, Electrical Safety, Fall Protection, etc.

Training for Atmospheric Monitoring Personnel	**GE Course**
Instrumentation Training	Local responsibility with equipment to be used

19.6. Training for Entrants should include:

19.6.1. Explanation of the general hazards associated with confined and permit spaces

19.6.2. Discussion of specific permit space hazards associated with the site, location or operation

19.6.3. Reason for, proper use, and limitations of PPE and other safety equipment required for entry into permit spaces

19.6.4. Explanation of permits and other procedural requirements for conducting a permit space entry

19.6.5. Description of how to recognize symptoms of overexposure to probable air contaminants in themselves and co-workers, and method(s) for alerting attendants

19.6.6. Self-rescue techniques

19.6.7. Hands-on demonstration of Entry Permitting process and equipment they would use while entering a space (i.e. Harness, life line, Retrieval Device, etc)

19.6.8. Other training may be required for the entrant if the permit space dictates a need. Other training may include but is not limited to: LOTO Authorized, Electrical Safety, Fall Protection, etc.

Training for Confined Space Entrants	GE Course
Confined Space Entry Training	MyLearning, EHS-200

19.7. Training for Attendants should include the following:

19.7.1. Explanation of the general hazards associated with confined and permit spaces

19.7.2. Discussion of specific permit space hazards associated with the site, location or operation

19.7.3. Reason for, proper use, and limitations of PPE and other safety equipment required for entry into permit spaces

19.7.4. Explanation of permits and other procedural requirements for conducting a permit space entry

19.7.5. Description of how to recognize symptoms of overexposure to probable air contaminants by entrants

19.7.6. Procedures for summoning rescue or other emergency services, and

19.7.7. Proper utilization of equipment used for communicating with entry and emergency/rescue personnel

19.7.8. Non-Entry Rescue procedures

19.7.9. Other training may be required for the attendant if the permit space dictates a need. Other training may include but is not limited to: LOTO Authorized, Electrical Safety, Fall Protection, etc.

Training for Confined Space Attendants	GE Course
Non-Entry Rescue	Local responsibility with equipment to be used
Summoning Entry Rescue Service	Local responsibility based on local procedures
Communication with Entrants	Local responsibility based on methods available
Confined Space Entry Training	MyLearning, EHS-200

19.8. Training for Emergency Response Personnel should include:

19.8.1. Rescue plan and procedures developed for each type of permit space that are anticipated to be encountered,

19.8.2. Use of emergency rescue equipment,

19.8.3. First aid and CPR techniques, and

19.8.4. Work location and permit space configuration to minimize response time

19.8.5. Initial and annual hands-on demonstration of a simulated rescue to reinforce training

19.8.6. Other training may be required for the Emergency Response Personnel if the permit space dictates a need. Other training may include but is not limited to: LOTO Authorized, Electrical Safety, Fall Protection, etc.

19.8.7. Training sessions should be repeated as often as necessary (Recommendation: Annually for those performing rescue infrequently and every 3 years for those performing rescue services frequently) to maintain an acceptable level of personnel competence.

Training for Emergency Response Personnel	GE Course
Confined Space Entry Training	MyLearning, EHS-200
First Aid / CPR	Red Cross, Red Crescent, or other qualified local resource
Use of Emergency Rescue Equipment	Local responsibility with equip to be used

Refresher training for Entry Supervisors, Entrants, and Attendants is **required e very two years, or whenever it is found that deviations from established procedures are occurring or employee knowledge about how to execute the procedures is inadequate.**

19.9. All training must be documented and at least include each employee's name, the signatures or initials of the trainers, and the dates of training. The certification shall be available for inspection by employees and their authorized representatives.

20. Program Review and Record Keeping

20.1. Targeted inspections of active permit space work activities must be made on a regular basis to verify that procedures are being followed. A specific inspection schedule should be established and can be linked to Element 8, or independent of Element 8.

20.2. Each GE location should conduct an annual audit of the site's permit space program by completing the Confined Space Entry Self Assessment in PowerSuite.

20.3. A review and update of locations written program must take place annually and after:

20.3.1. There is reason to believe that the measures taken under the permit space program may not protect employees

20.3.2. Any unauthorized entry of a permit space

20.3.3. The detection of a permit space hazard not covered by the entry permit

20.3.4. The detection of a condition prohibited by the entry permit

20.3.5. The occurrence of an injury or near-miss during permit entry

20.3.6. A change in the use or configuration of a permit space

20.3.7. A employee complains about the effectiveness of the program

20.3.8. As part of the Health & Safety Framework annual program review under Element 20.